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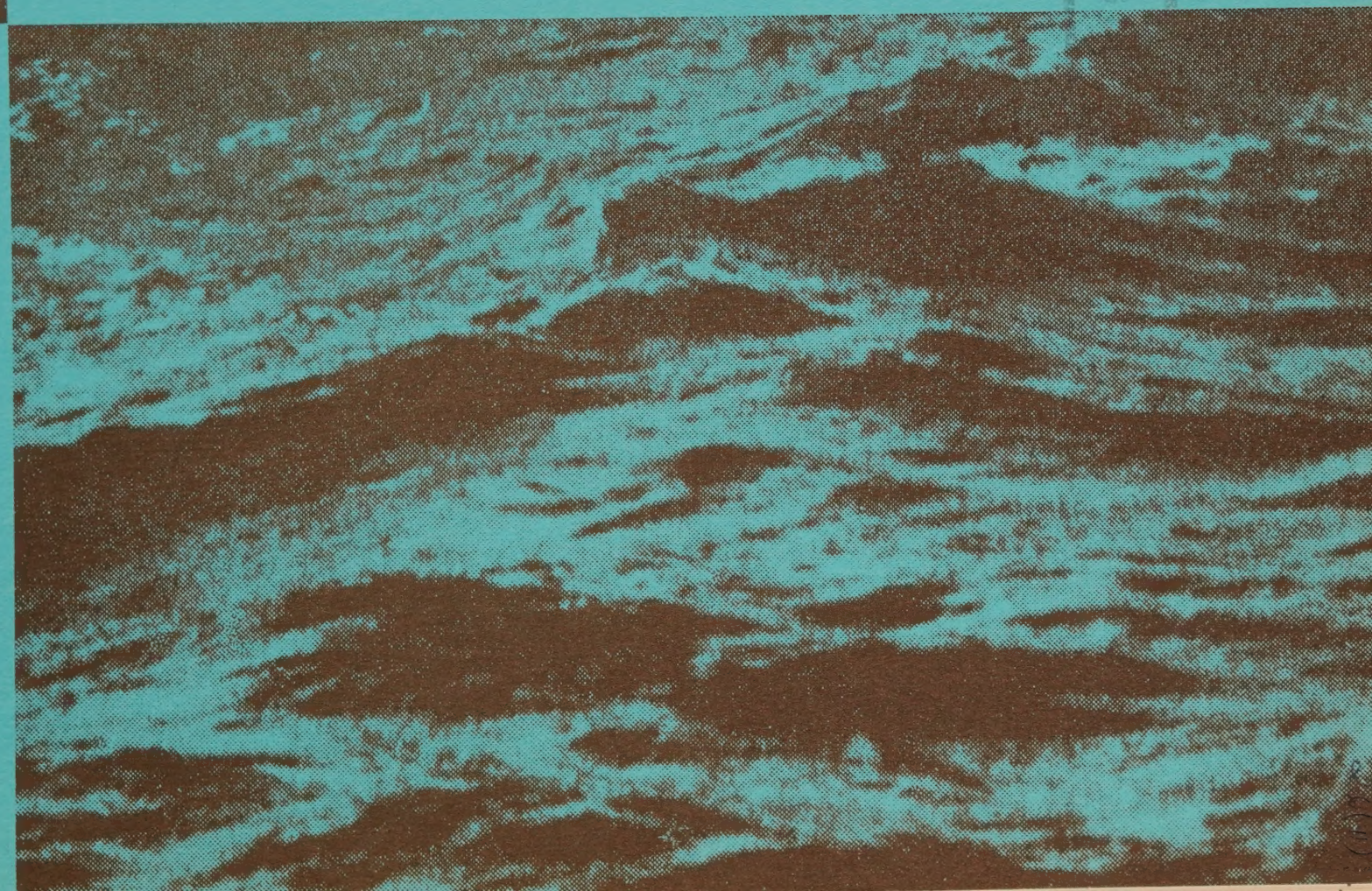

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FOREWORD

The Department of Commerce's National Marine Fisheries Service publishes the monthly journal *Marine Fisheries Abstracts* as one means of communicating to the fishing industry and allied groups the status of current fishery research. The research includes the biological aspects of fishery science as well as technological studies dealing with aquatic resource supply, harvesting, processing, utilization, and distribution.

Marine Fisheries Abstracts contains summaries of selected articles from trade, engineering, and scientific journals dealing with the entire spectrum of fishery science. The publication is designed to serve the needs of fishery scientists, engineers, and managers in industry, academic institutions, and government by supplying timely information on current progress in fishery research and technology.

For sale by the Superintendent of Documents, U.S. Government Printing Office Washington, D.C. 20402 - Subscription price: $6.50 per year, ($1.75 additional for foreign mailing). Single copy 65 cents.

0.33 SYMPOSIUM: PROTEIN INTERACTIONS IN BIOSYSTEMS
PROTEIN-LIPID INTERACTIONS

Karel, M. (Dept. of Nutrition and Food Science, Massachusetts Institute of Technology, Cambridge, MA 02139)
Journal of Food Science 38, No. 5, 756-763 (July-Aug. 1973)

Interactions between proteins and lipids are involved in important processes in food and biological systems. This article is a review of current information on the mechanism of lipid-protein interactions and the status of research on the interactions between oxidizing lipids and proteins.

In most isolated, natural, lipid-protein complexes, phospholipids are contained in the lipid fraction. Electrostatic forces may be involved in phospholipid binding to proteins. Another mode of binding is the formation of salt bridges through divalent metals such as calcium. These two forms of binding may occur simultaneously and cooperatively. Hydrophobic bonding may occur in lipid-protein complexes when nonpolar groups interact in aqueous media. The author discusses the changing concepts of biological membrane structure. The phospholipid leaflet or bilayer was the earliest accepted model of cell membrane structure. From it came the unit membrane concept which proposed that the phospholipid polar groups in the bilayer were bound by polar interactions to proteins of extended chain configuration. Later studies on membranes yielded new information that changed the lamellar concept to a globular form of membrane. The globular membrane consists of repeating lipoprotein units, one layer thick. This concept was modified to a double layer of globular protein subunits with phospholipid located between the subunits.

0.35 (4.13) NON-METHYLENE-INTERRUPTED FATTY ACIDS IN LIPIDS OF SHALLOW-WATER MARINE INVERTEBRATES: A COMPARISON OF TWO MOLLUSCS (LITTORINA LITTOREA AND LUNATIA TRISERIATA) WITH THE SAND SHRIMP (CRANGON SEPTEMSPINOSUS)

Ackman, R. G., and S. N. Hooper (Fisheries Research Board of Canada, Halifax Laboratory, Halifax, Nova Scotia, Canada)
Comparative Biochemistry and Physiology 46, No. 1B, 153-165 (Sept. 15, 1973)

Open-tubular gas-lipid chromatography was used to examine the fatty acids from the total lipids and certain lipid fractions of the periwinkle (L. littorea), moon snail, and the sand shrimp. Two sets of novel fatty acids were found; they seem to have nonmethylene-interrupted structures in which two of three eicosadienoic acids each have one ethylenic bond in the Δ^5 position and the others in positions mimicking the corresponding normal monoethylenic fatty acids, while in two docosadienoic acids the first ethylenic bond may be in the Δ^7 position. These novel fatty acids did not appear to be components of the lipids of the sand shrimp; however, sand shrimp lipids shared with the mollusks emphasis on chain extension of 9-hexadecenoic acid to 13-eicosenoic acid.
[2 figures, 3 tables, 37 references] FTP

0.35 THE BIOSYNTHESIS OF ASTAXANTHIN--XIV. THE CONVERSION OF LABELLED β-CAROTENE-15,15′-$^3H_2$ INTO ASTAXANTHIN IN THE CRAB, PORTUNUS TRITUBERCULATUS

Katayama, Teruhisa, Yoko Kunisaki, and Makoto Shimaya (Laboratory of Marine Biochemistry, Faculty of Fisheries, University of Kagoshima, 470, Shimoarata, Kagoshima, Japan), K. L. Simpson, and C. O. Chichester (Dept. of Food and Resource Chemistry, University of Rhode Island, Kingston, RI 02881)
Comparative Biochemistry and Physiology 46, No. 2B, 269-272 (Oct. 15, 1973)

In an earlier report, the senior author and his coworkers showed that canthaxanthin, 4-hydroxyechinenone, 3-hydroxycanthaxanthin, and astaxanthin and β-carotene, echinenone, isocryptoxanthin, and astaxanthin could be isolated from the carapace and internal organs, respectively, of the crab. However, because these crabs were from a natural habitat, it was not possible to determine the origin of the various pigments with certainty. In the present study, the researchers attempted to determine the metabolic pathway of the pigment by the use of labeled β-carotene-15,15′-$^3H_2$ in the diet of the crabs. The crabs were cultured in the laboratory for over a month by feeding them a special diet without added β-carotene in order to condition them to the particular diet. Then the crabs were fed for 2 weeks the special diet containing β-carotene-15,15′-$^3H_2$ dissolved in soybean oil. At the end of this 2-week period, the internal organs and the carapace of the crabs were analyzed separately for the various pigments. The results indicate that β-carotene-15,15′-$^3H_2$ was converted to labeled astaxanthin through the steps of isocryptoxanthin, echinenone, canthaxanthin, and 3-hydroxycanthaxanthin.

0.38 (9.6) PRINCIPLES OF ENZYMOLOGY FOR THE FOOD SCIENCES

Whitaker, John R.
Marcel Dekker Inc., New York (1972), v + 636 pp. $26.50.
C. L. Walters (reviewer)
Journal of Food Technology 8, No. 1, 116-117 (Mar. 1973)

The introduction of this treatise contains a long list of the established and suggested functions of enzymes during the processing of foodstuffs. It also discusses the theoretical aspects of enzyme action and covers such topics as the techniques for enzyme purification and the effects of enzyme catalyzed reactions of such factors as substrate concentration, enzyme concentration, pH, temperature, and the actions of enzyme inhibitors. The second part of the book may be of more interest to food scientists who are concerned with the use of endogenous or exogenous enzymes during food processing or with the control of deleterious changes caused by these enzymes. The various chapters in this part deal with glycosidic hydrolases, pectic enzymes, esterases, enzymes involved in degradation of nucleic acids, proteolytic enzymes, and oxido-reductases, including lactate dehydrogenase, glucose oxidase, polyphenol oxidase, xanthine oxidase, catalase, peroxidase, and lipoxidase. For each type of biological catalysis, the specificity and mechanism of action are discussed. The book is well indexed and it should be useful to the food scientist to make full use of the potentialities of enzymes in providing products of the caliber demanded by modern technology. FTP

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On the basis of these results and those of previously published studies, the authors classified aquatic animals into three classes based upon their biosynthesis of astaxanthin as follows:

1. Red carp--form. These species can convert lutein or zeaxanthin to astaxanthin; ß-carotene is not the major precursor of astaxanthin. These fish can transfer the astaxanthin from their diet to body astaxanthin.
2. Sea bream--form. These species can convert ß-carotene, lutein, or zeaxanthin to astaxanthin, and also transfer the astaxanthin in their diet to body astaxanthin.
3. Prawn--form. These species can convert ß-carotene to their body astaxanthin. Almost all the crustacea that contain astaxanthin in their body belong to this group. This group has two subclasses. One subclass (includes the prawns Penaeus japonicus and Metapenaeopsis barbata) can convert ß-carotene to astaxanthin in the internal organs. The other subclass (includes the lobster Panulirus japonicus and the crab P. trituberculatus) can convert ß-carotene to astaxanthin, but they can also, in their internal organs, convert ß-carotene to its intermediates, and these intermediates can be metabolized to astaxanthin in the cells of other parts of the animal.

[1 table, 17 references]

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0.4 RAPID NITROSATION OF PHENOLS AND ITS IMPLICATION FOR HEALTH HAZARDS FROM DIETARY NITRITES

Challis, B. C. (Dept. of Organic Chemistry, Imperial College, London SW72 AY, England)

Nature 244, No. 5416, 466 (Aug. 17, 1973)

The presence of sodium nitrite in food as a preservative may result in the formation of secondary N-nitrosamines, which are carcinogenic to laboratory animals. Nitrosamines may form in the food itself during processing or in the digestive tract by combination of nitrite with secondary amines. Only minute amounts of N-nitrosamines have been detected in preserved food so far. There is less information about the carcinogenicity of nitrosophenolic compounds than for nitrosamines, but there is clear evidence that the nitrosation of phenolic compounds is much faster than nitrosation of most secondary amines. Phenols in the digestive tract, other reports indicate, readily undergo nitrosation by a pH independent pathway from pH 1 to 5. The reaction should be more rapid with polyhydroxylated and polycyclic aromatic compounds, such as catechol and 2-naphthol, respectively. The dietary intake of phenolic compounds (in plant and animal foods) is more than that of secondary amines. Gastric juice also contains phenolic materials. The author suggests that nitrosophenols are more likely to be produced than N-nitrosamines through the use of nitrites as food preservatives. Furthermore, if nitrosophenols formed in the digestive tract prove harmless, then the phenolic compounds present in the diet and gastric juice may combine with the nitrite salts before they can react with secondary amines or other nitrogenous material present from which N-nitrosamines may form.

[1 table, 12 references]

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In the current membrane model, reported by Singer and Nicolson [Science 175, 720 (1972)], the phospholipid bilayer forms a continuing membrane. Within the bilayer, various protein forms exist as globular, alpha-helix containing units, or in extended chains (beta configuration). These forms of protein may interact with the lipids by polar or hydrophobic bonding. This model allows protein-lipid complexes to form either hydrophilic or hydrophobic "gates" allowing transport across the membrane.

Lipid protein interactions are important in the properties of foods. Lipid protein complexes are involved in the aging of meat and the changes occurring in frozen meat and fish. The stability of some food emulsions may depend on lipoproteins which are potentially able to form strong films around oil droplets. Some lipoproteins, such as in egg and milk, seem to promote foams. Lipid protein interactions occur in the processing of milk products such as in the manufacture of cream, ice cream, and butter. Other interactions in lipid protein complexes described by the author include those in wheat flour, dough, and bread, and in textured food preparations. Another reaction that is being investigated is the peroxidation of lipids in lipid protein systems. Peroxidized lipids may react with proteins forming toxic or biologically active compounds in foods. In vivo lipid peroxidation may be involved in disease processes.

[13 figures, 50 references]

SW

0.35 LUMISOMES, THE CELLULAR SITE OF BIOLUMINESCENCE IN COELENTERATES

Anderson, James M., and Milton J. Cormier (Dept. of Biochemistry, University of Georgia, Athens, GA 30601)

Journal of Biological Chemistry 248, No. 8, 2937-2943 (Apr. 25, 1973)

A membrane-enclosed subcellular particle that was responsible for bioluminescence was isolated from 10 species of bioluminescent coelenterates. The animals studied were species of Obelia and Clytia from class Hydrozoa and species of Renilla, Ptilosarcus, Stylatula, Acanthoptilum, and Parazoanthus from class Anthozoa. The purified particle preparations appeared homogeneous in size and shape when examined by electron microscopy; they had a diameter of about 0.2 µm and were enclosed by a unit membrane. The particles had all the proteins necessary to produce the typical green bioluminescence noted in vivo in these animals. These include the calcium-triggered photoprotein luciferase and a green fluorescent protein. The particles show bioluminescence when they are placed in hypotonic solutions of calcium ion; oxygen is also required. The authors suggest that the widespread occurrence of the bioluminescent particles in the coelenterates indicates that they represent the cellular site of bioluminescence in these animals. They propose that these particles or organelles be called lumisomes.

[8 figures, 3 tables, 26 references]

FTP

0.5 (7.86) A BACTERIOLOGICAL PRESSURE-RETAINING DEEP-SEA SAMPLER AND CULTURE VESSEL

Jannasch, H. W., C. O. Wirsen, and C. L. Winget (Woods Hole Oceanographic Institution, Woods Hole, MA 02543)
Deep-Sea Research 20, No. 7, 661-664 (July 1973)

In order to overcome the decompression problem in deep-sea bacteriological sampling, the authors designed and constructed an instrument that could be used as a sampler and pressurized culture vessel. The device collects a 1-liter sample; the sample does not undergo a change of pressure during filling of the vessel, nor during retrieval to the surface and prolonged periods of incubation in the laboratory. Subsamples of 13 ml may be taken without affecting the pressure within the vessel. The instrument has provision for easy pressure adjustment and internal mixing.
[3 figures, 7 references] FTP

0.6 (0.5) INHIBITION OF STAPHYLOCOCCAL ENTEROTOXIN PRODUCTION IN CONVENIENCE FOODS

Heidelbauer, R. J., and R. R. Middaugh (Dept. of Bacteriology, South Dakota State University, Brookings, SD 57006)
Journal of Food Science 38, No. 5, 885-888 (July-Aug. 1973)

The food industry needs information on environmental conditions which will prevent the production of staphylococcal enterotoxin during food processing, packaging, and storage. An investigation by the authors generated data showing the effects of combinations of environmental conditions on enterotoxin B production in slurries of cheese, ham, and shrimp. The environmental conditions tested included temperature, initial pH, NaCl concentration, and atmospheres of CO_2, N_2, and air. The method of detection of enterotoxin producing Staphylococcus aureus was the fluorescent antibody technique (FAT) developed by R. L. Stark and P. R. Middaugh [Appl. Microbiol. 18, 631 (1970)]. The FAT technique was found to be reliable in the rapid detection of enterotoxin B except in food slurries held under atmospheres of high CO_2 or N_2 concentrations.

Enterotoxin production in cheese slurry was found to be inhibited by the following conditions: temperature of 44° C combined with initial pH below 7; and the combination of a temperature of 37° C, pH 7, and NaCl concentration of 6% and above. In shrimp slurry, enterotoxin production was inhibited by a pH of 7 or less and by 8% NaCl concentrations at a temperature of 37° C. Concentrations of NaCl above 6% at 37° C and pH values below 9 inhibited enterotoxin production in ham slurry. An atmosphere of CO_2 inhibited cell fluorescence without affecting enterotoxin production or detection by the gel diffusion method [Public Health Rep 78, 1089 (1963)].

0.6 CHEMISTRY AND TECHNOLOGY OF PACIFIC FISH

Kizevetter, I. V. (editor) (Pacific Scientific Research Institute of Marine Fisheries and Oceanography (TINRO, Leninskaya 20, Vladivostok, U.S.S.R.)
Translated from the Russian (1973), 304 pp. Available from the U.S. Dept. of Commerce, National Technical Information Service, Springfield, VA 22151. Order No. TT72-50019. Price not given.

The far eastern fish canneries and processing plants of the U.S.S.R. use various raw materials that differ in technological characteristics and chemical composition. In the search for the most profitable process procedures and to establish a good assortment of products, it was necessary to determine the mechanical, physical, and chemical characteristics of the raw material. The fishery activities of the U.S.S.R. in the Pacific Ocean are dependent on many species of fish, crustaceans, mollusks, mammals, and marine plants. Chemical analyses of tissues and other substances were carried out on samples from these species. The findings were used to develop effective procedures for utilizing this raw material, and the information was arranged in this book under the zoological classification assigned to the organisms that are found in the fisheries. The subclass Cyclostomata is the first category treated in this manner, and the sea lamprey comprises part of the catches. The information provided on these fishes includes length and weight, plus moisture, fat, protein, and ash content relative to season and place of capture. Various tissues of the body have also been analyzed. Also included is the vitamin content of flesh, liver, skin, and gonads. The chemical composition of canned,

0.6 STUDIES ON THE USE OF CALCIUM CARBONATE IN THE FEEDING OF LAYING HENS DURING SUMMER MONTHS

Tortuero, Francisco, and Carmen Centeno (Instituto de Alimentación y Productividad Animal, C.S.I.C., Ciudad Universitaria, Madrid-3, Spain)
Poultry Science 52, No. 3, 866-872 (May 1973)

These feeding studies with laying hens were carried out to determine the influence of different levels of calcium carbonate on production indexes and shell quality at temperatures above 30° C. The calcium carbonate was ground and incorporated into the diet of the hens or was used as supplemental granules. Also, the effects of dietary calcium levels or supplementation on the calcium and nitrogen retention and on the digestibility of fat and crude fiber were determined. The calcium carbonate was provided through the use of a fossiliferous calcareous rock containing 99.7% calcium carbonate (39.9% Ca) and free of magnesium.

Ten-month-old commercial egg-type hens were used. The feeding test lasted 3 months. The various diets were isocaloric and isonitrogenous, but varied only in the level of calcium. The dietary calcium levels were 2.68%, 3.86%, and 4.18%. One part of each of the groups fed 2.68% and 3.86% dietary levels of calcium was also given daily supplements of calcium carbonate granules equivalent to 1.14 g of calcium per bird per day. Evaluations were made of egg production and egg quality, and on calcium and nitrogen retention and digestibility of the fat and crude fiber.

The results indicated that, when the environmental temperature rose above 30° C, levels of calcium of more than 2.68% of the diet (or as the addition of supplemental granules) were needed for optimum egg production of the hens and for optimum

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baked, and smoked sea lamprey is given. The Elasmobranchii, of the class Chondrichthyes (sharks and skates), are treated in a similar manner. The largest portion of the book is devoted to the superorder Teleostei (or subclass Neopterygii) under which the well-known fish families are classified: Clupeidae (herring, sardine), Engraulidae (anchovies), Salmonidae (salmons), Coregonidae (whitefish), Osmeridae (smelts), Cyprinidae (carp), Gadidae (cod), Scombridae (mackerel and tuna), and Pleuronectidae (flounders). Tables and graphs showing composition accompany the text, and an extensive bibliography, from Russian and other language sources, is provided.

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eggshell quality. The weight of the eggs did not increase with the increasing calcium levels fed the hens. Feed consumption was less with the increasing level of calcium fed. Calcium retention increased at the lower levels of calcium in the diet. It appears that 2.0 g of utilizable calcium per bird per day is optimal.

When calcium carbonate in the form of granules was fed to the hens, the values for nitrogen retention and for fat and crude fiber digestibility increased; probably the presence of these granules in the gizzard or intestine of the birds facilitated digestion.

[4 tables, 22 references]

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0.119 A CAGE DESIGNED FOR METABOLISM- AND NITROGEN BALANCE (7.9) (0.7) TRIALS WITH MINK

Jørgensen, G., and N. Glem Hansen (National Research Institute of Animal Nutrition, Experimental Fur-Farm, Hillerød, Denmark)
Acta Agriculturae Scandinavica 23, 3-4 (1973)

The cages used for normal production of mink are not suitable for use in metabolism and nitrogen balance studies. This article gives the details for the construction of a cage for such studies with mink.

[3 figures, 2 references]

FTP

0.6 SODIUM AND CHLORIDE REQUIREMENTS OF THE CHICK: RELATIONSHIP TO ACID-BASE BALANCE

Hurwitz, S., I. Cohen, A. Bar, and S. Bornstein (Institute of Animal Science, Agricultural Research Organization, Volcani Center, Bet Dagan, Israel)
Poultry Science 52, No. 3, 903-909 (May 1973)

The researchers examined the sodium and chloride requirements of broiler-chicks in view of the interaction between these ionic components of the diet in the acid-base balance of the body. They found that with increasing levels of an optimal sodium-chloride mixture in the diet of the chick, body weight gain increased linearly to reach a peak with a diet containing 0.13% sodium and 0.13% chloride.

[2 figures, 1 table, 12 references]

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THE ESSENTIAL NATURE OF GLYCINE AND PROLINE FOR GROWING CHICKENS

Graber, George, and David H. Baker (Dept. of Animal Science, University of Illinois, Urbana, IL 61801)
Poultry Science 52, No. 3, 892-896 (May 1973)

The chick requires a dietary source of 12 amino acids for maximal weight gain and gain/feed ratio. Only proline and glycine-serine are synthesized in vivo. Most of the data showing a dietary need for glycine and proline were obtained from studies using the young chick over a fairly short assay period. In the present study, four assays were carried out to determine the influence of age, length of feeding period, and prior dietary regimen on the essentiality of glycine and proline for growing chickens.

A complete purified diet was used. The loss of nitrogen resulting from deletion of glycine and/or proline was replaced by glutamic acid. Cornstarch was added to the diet at levels required to maintain the ingredient total at 100%. Feed and water were available ad libitum to the chickens. The feeding test period was 8 weeks posthatching.

Both glycine (in the absence of dietary serine) and proline were essential for maximal performance of the chickens at all stages of life from hatching to 8 weeks posthatching. Apparently, the growing chicken can synthesize about 90% of its proline needs and about 60% to 70% of its glycine needs for maximal growth.

[4 tables, 22 references]

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0.6 (0.5)

An N_2 atmosphere inhibited cell fluorescence when combined with NaCl concentrations of 6% and above. An N_2 concentration above 50% in the atmosphere inhibited enterotoxin detection by the gel diffusion method. Nitrogen levels of 25%, 50%, and 100% in the atmosphere combined with 6% NaCl concentrations, inhibited production of enterotoxin.

These results can aid investigators of food poisoning cases to predict the combinations of conditions that promoted toxin production. In addition, the data can assist food processors in setting conditions that will prevent toxin production.

[6 tables, 8 references]

SW

0.38 ENZYMES INVOLVED IN THE LAST STEPS OF THE BIOSYNTHESIS (6.31) OF MANNITOL IN BROWN ALGAE

Ikawa, Tomoyoshi, Tsuneo Watanabe, and Kazutosi Nisizawa (Fac. Sci., Kyoiku, Univ., Tokyo, Japan)
Chemical Abstracts 78, No. 17, 107541 (Apr. 30, 1973)

0.7 (2.3) EFFECTS OF COOKING AND RINSING ON THE PROTEIN LOSSES FROM BLUE CRABS

Hanover, L. M., N. B. Webb, A. J. Howell, and F. B. Thomas (Dept. of Food Science, North Carolina State University, Raleigh, NC 27607)
Journal of Milk and Food Technology 36, No. 8, 409-413 (Aug. 1973)

The liquid produced during the processing of blue crabs is discharged as waste material. Liquids lost during processing are considered to be exudates rather than drip loss which is associated with freezing and thawing. The liquids lost from blue crab processing can result from washing, rinsing, cooking, meat extraction, and sometimes cooling processes. The authors suggest that these lost liquids contain significant amounts of protein. Studies were performed to determine the amount of protein in the lost liquids and the effect of controlled rinsing and dipping operations on the amount of protein lost.

Crabs were steamed at either 100° or 121° C under pressure. The higher temperature resulted in a greater amount of cook loss fluids than those from steaming at the lower temperature. Analysis of the fluids resulting from steaming at 121° C showed that the protein content was higher than fluids resulting from steaming at 100° C. Rinsing samples of steamed crab meat with tap water resulted in protein losses of 15.2% in the 100° C process meat and 12.6% in the 121° C process meat. Dipping crabmeat samples steamed at 100° C in salt brine solution resulted in a protein loss of 11.2%; crab meat steamed at 121° C and treated similarly resulted in a loss of 7.3%.

[1 figure, 4 tables, 13 references] SW

0.7 EFFECT OF FEEDING RESTRICTED AMOUNTS OF A MEDIUM- AND HIGH-PROTEIN DIET ON GROWTH AND BODY COMPOSITION OF DUCKLINGS

Auckland, John N. (Loughry College of Agriculture and Food Technology, Cookstown, North Ireland)
Journal of the Science of Food and Agriculture 24, No. 6, 719-726 (June 1973)

Carcasses of ducklings usually contain much more fat than do carcasses of chickens or turkeys of comparable age or body weight. For example, 7.5-week-old ducklings showed about 65% fat in their carcass dry matter, whereas 7-week-old turkeys showed about 12% fat in their carcass dry matter and 20-week-old turkeys showed about 25% fat in their carcass dry matter. In the present study, the researcher examined the effects of feeding restricted versus unrestricted amounts of a medium- and of a high-protein diet on growth, feed efficiency, and chemical composition of young ducklings. Two hundred and sixteen ducklings (both sexes) were fed diets containing either 19.5% or 24.7% crude protein, either to appetite or to 85% of appetite, from age day 1 to age 21 or 24 days.

No significant interactions were found between dietary protein level and level of feeding for body weight, food intake, or food conversion ratios at 21 days of age. At 21 days of age, the ducklings fed the 24.7% protein diet were 28% heavier than those fed the 19.5% protein diet, and the ducklings fed the higher level of intake (to appetite) were 17% heavier than those on the restricted level of intake (85%). At 24 days of age the body weight of the ducklings on the restricted level of intake was about the same as that of those fed the higher level

0.7 EFFECT OF FEEDING RESTRICTED AMOUNTS OF A MEDIUM AND A HIGH PROTEIN DIET DURING THE FINISHING PERIOD ON GROWTH, FAT DEPOSITION AND FEED EFFICIENCY OF MALE AND FEMALE BROILERS

Auckland, John N., and Robert B. Fulton (Loughry College of Agriculture and Food Technology, Cookstown, Co. Tyrone, North Ireland)
Journal of the Science of Food and Agriculture 24, No. 6, 709-717 (June 1973)

For profitable production of meat, animals should reach market weight in the shortest possible time (to minimize maintenance time and to maximize the fraction of the food consumed that is used for growth). In this study, a feeding test with broilers was carried out to examine the effects of feeding restricted amounts of a medium-protein and a high-protein diet on growth, feed efficiency, and body composition. Male and female broilers in separate groups were fed either a 20% (medium protein) or a 23% (high protein) diet, at four levels of intake (ad libitum and about 96%, 92%, and 87% of the ad libitum rate) from 35 to 56 or 60 days of age. All the groups received the same commercial starter diet from day 1 to 35 days of age. In order to allow comparison of food conversion and body composition on an equal body weight basis, the broilers on the most severely restricted diet groups were continued on treatment up to 60 days of age when it was estimated that their live weights would have reached the weight level attained by corresponding groups fed ad libitum for 56 days.

The male broilers ate more and grew faster and showed a better feed conversion than the female birds. At market age, the male bird carcasses were significantly leaner than the female carcasses.

0.7 (0.32)(9.6) PROTEINS IN HUMAN NUTRITION

Porter, J. W. G., and B. A. Rolls (editors) (National Institute for Research in Dairying, Shinfield, Reading, England)
Academic Press, 111 Fifth Ave., New York, NY 10003 (Mar. 1973), xii + 562 pp. £9.50 (ca $30.00).

This book contains a series of reports from a NATO Advanced Study Institute on the Chemistry, Biology, and Physics of Protein Evaluation held in Reading, England, in March 1972. It is divided into four sections. The first section (7 papers) considers world protein supplies and requirements. The second (16 papers) deals in detail with the techniques for the assessment of the nutritive value of protein. The third (7 papers) deals with the role of the food scientist in the development and use of various protein isolates. The final section (6 papers) considers some of the factors (digestion of proteins, amino-acid supplementation, toxic factors, etc.) that affect the utilization of protein. FTP

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of intake at 21 days of age. From age 1 to 21 days, feed efficiency for the ducks fed the high-protein diet was better than that for the birds fed the medium-protein diet; the feed efficiency was similar for the two levels of food intake. Food efficiency for the ducklings on the restricted intake level during the 1- to 24-day period was slightly worse than that of those birds of similar body weight fed the higher level of intake for from 1 to 21 days.

At 21 days of age, the carcasses of the ducklings fed 24.7% protein contained 31% dry matter, of which 34% was fat and 53% was protein, and the carcasses of the birds fed 19.5% protein contained 34% dry matter, of which 41% was fat and 48% was protein. The reduction in body fat due to dietary protein level was about twice the magnitude of the reduction in body fat due to the about 16% reduction in feed intake. Feeding the ducklings the higher protein diet reduced body fat and at the same time promoted a significantly faster gain in live weight; moderate feed restriction resulted in smaller and only slightly leaner birds. Apparently, feeding ducklings excess protein may offer more scope than quantitative restriction in feed in reducing their body fat.

[3 tables, 7 references] FTP

1.0119 [OUR MOST IMPORTANT FISHING RESOURCE]
(1.87) NUESTRO RECURSO PESQUERO MÁS IMPORTANTE

Prepared by Cent. Invest. Pesq., Havana, Cuba
Mar. Pesca. 80, 12-19 (1972) (In Spanish)
Aquatic Sciences & Fisheries Abstracts 3, No. 6, 228, Abstract No. 3Q6710M (June 1973)

Cuban lobster fishing goes back 60 years. The catch in the 1930's was about 546 metric tons annually; in 1969, the catch rose to 11,131 tons. Most of the catch is frozen and canned at eight plants. The lobster fleet consists of many sizes of vessels of various ages, and lobsters are fished as far as the Bahamas Great Bank. During the year, about 20% of the lobster catch is obtained in the first 3 months, 10% in the next 3 months, 30% in the next 3 months, and about 40% in the last 3 months. About 12 kinds of lobsters have been identified in the catch. In managing the fishery, the National Fishing Institute has limited the catch to 8,400 to 10,300 metric tons annually; in addition, only lobsters 21 cm and larger are permitted to be taken. Studies indicate that the Gulf of Batabano is the major source of larvae of the Cuban lobsters. SW

0.7 INFLUENCE OF FLUORIDE INTAKE ON REPRODUCTION IN MICE

Messer, H. H., W. D. Armstrong, and L. Singer (Dept. of Biochemistry, University of Minnesota, Minneapolis, MN 55455)
Journal of Nutrition 103, No. 9, 1319-1326 (Sept. 1973)

This study was carried out to find out whether fluorine is essential in the diet. In an earlier preliminary report, the authors described a progressive infertility in female mice on a restricted fluoride intake, and a recovery from infertility following addition of fluoride to the diet. The present article is a more comprehensive report of the previous study. Because other workers reported that mice are tolerant to very large intakes of fluoride, the present researchers also studied the effects of a high intake of fluoride on growth and reproduction to determine the levels at which signs of toxicity first appeared.

"Female mice were fed a low fluoride diet (0.1 to 0.3 ppm fluoride) plus drinking water containing 0, 50, 100 or 200 ppm fluoride as sodium fluoride. Toxic effects of fluoride were evidenced by retarded growth and impaired reproduction in mice with intakes of 100 and 200 ppm fluoride, and the higher level resulted in a high mortality rate (50% deaths in 5 weeks). Mice with a low fluoride intake developed signs of fluorine deficiency, with a progressive development of infertility in two successive generations. Growth rate and litter size were not affected by the low fluoride intake, but the percentage of mice producing litters was lower, and the age at delivery of the first litter was greater than in mice receiving 50 ppm fluoride."

The authors conclude that there is now strong evidence that fluoride is required in the diet, at least that of mice.

[3 figures, 6 tables, 30 references] The first and last paragraph are abstracted; the second paragraph is the authors' abstract.]

0.7

On the average, the broilers fed the high-protein level diet ate a similar amount of food, grew at a slightly slower rate, and converted food to body weight less efficiently than the birds fed the medium-protein level diet. The carcass dry matter of the birds fed the 23% crude protein diet showed about 2 percentage points less ether extractives than the carcass dry matter of the birds fed the 20% crude protein diet.

During the test feeding period of from 35 to 56 days, the growth rate and feed conversion efficiency decreased as the feed allowance was reduced. Those groups fed the lowest level of food intake for 60 days showed somewhat leaner carcasses than those fed ad libitum for 56 days. The feed conversion for the birds fed the lowest level of food intake for from 35 to 60 days was less efficient than the feed conversion for the birds fed ad libitum for the shorter period of from 35 to 56 days, even though the final live weights were the same for both groups and the body fat content of the former group was lower. These results support the premise that feed efficiency is maximized when broilers reach market weight in the shortest possible time.

[5 tables, 5 references] FTP

2.00 (2.19)(1.5) COMPARISON OF CHANGES IN TRIMETHYLAMINE, DIMETHYLAMINE, AND EXTRACTABLE PROTEIN IN ICED AND FROZEN GADOID FILLETS

Castell, C. H., W. E. Neal, and J. Dale (Fisheries Research Board of Canada Halifax Laboratory, Halifax, Nova Scotia, Canada)
Journal of the Fisheries Research Board of Canada 30, No. 8, 1246-1248 (Aug. 1973)

The effects of iced and frozen storage were compared on the production of trimethylamine (TMA) and dimethylamine (DMA), and on decreases in extractable protein nitrogen (EPN) in fillets from deep-sea Atlantic cod, pollock, cusk, and hake. The fish were obtained from trawlers as they were being unloaded at dockside, and immediately filleted. The fillets from one side of the fish from each species were individually packaged in heat sealed, laminated plastic pouches, frozen at -40° C and stored at -5° C. The opposite set of fillets were similarly pouched, packed in ice, and stored in a room which was maintained at 3° C. Periodically, fillets from each species were removed for testing until the iced fillets were entirely unfit for human consumption.

The four species of fish produced similar amounts of TMA. In the iced fish the values for TMA, after an initial lag, rose sharply until within 15 days the fillets were badly spoiled and discarded. The frozen fillets of all species exhibited no TMA within 60 days. There were differences between species in production of DMA. In the iced fish, there were only small increases in DMA in cod, pollock, and cusk; however, there was a large, rapid increase in the hake fillets. In the frozen fillets, DMA production was highest in hake, and less in the cusk, pollock, and cod, in that order. In frozen and iced fillets, the production of DMA was accompanied by a decrease in extractable protein. The DMA does not affect the

2.05 WHAT SEAFOOD PROCESSORS SHOULD KNOW ABOUT VIBRIO PARAHAEMOLYTICUS

Lee, J. S. (Dept. of Food Science and Technology, Oregon State University, Corvallis, OR 97331)
Journal of Milk and Food Technology 36, No. 8, 405-408 (Aug. 1973)

This article is a compilation of information on the growth characteristics and requirements of V. parahaemolyticus. The rapid growth rate and the requirement of 2% to 4% NaCl in foods contaminated with the organism are described. Foods that are high in protein, with the required salt content, and pH levels above 5.8 will support the rapid growth of the organism. The optimum growth temperatures range between 35° and 37° C, but the organism can be inactivated by mild heat (48° C). At low temperatures, refrigeration at 3° C may be more detrimental than freezing at -18° C. Among the antibiotics tested, chlorotetracycline was the most effective at a concentration of 0.5 µg/ml. Among food preservatives, the most effective against the organism was propyl-p-hydroxybenzoate at concentrations ranging between 0.05 to 0.1 mg/ml. Sodium hypochlorite (12% available chlorine), diluted in a 3% NaCl solution to .003 of its original strength, inactivated the organism in 5 min. The major natural reservoir of V. parahaemolyticus appears to be the sea and the marine animals harvested from it. Preventing contamination of the finished product should be the objective of the seafood processor. In this activity, the time between landing and processing raw seafood must be short, and the temperature during this period should be kept low.
[36 references]

SW

2.113 MARINE SUCCESSION OF FOULING ORGANISMS IN HONG KONG, WITH A COMPARISON OF WOODY SUBSTRATES AND COMMON, LOCALLY AVAILABLE, ANTIFOULING PAINTS

Lee, S. W., and L. B. Talbot (Marine Science Laboratory, Chinese University of Hong Kong, Hong Kong)
Marine Biology 20, No. 2, 101-108 (May 1973)

Macrofaunal fouling organisms, on test blocks of various types of wood, were exposed in the subtropical waters of Hong Kong. Five types of locally available antifouling paints were coated on the wood blocks which were exposed from March to October 1970 in water at a depth of 1 m.

Results of the study showed that the initial foulers growing on the control block (of Chinese fir) were species of Balanus and Bugula. The latter eventually disappeared leaving a community dominated by the Balanus species which then declined and were succeeded by species of Styela and Mytilus. These organisms dominated the community. The hydrographic data in the test period showed changes in temperature and salinity. (The fluctuation in temperature was seasonal and changes of salinity were due to rainfall.) Neither of these environmental changes affected the growth of the fouling organisms. Teak wood was used for construction of boat hulls until its excessive cost in recent years resulted in building with cheaper yacal wood. This may prove to be false economy. Of the five types of wood tested (Chinese fir, camphor wood, yacal, teak, and pine), teak was the most resistant to the foulers, and yacal was the least resistant. Five types of antifouling paint were tested. All types contained 50% to 70% cuprous oxide as the antifouling component in the pigment portion. An effective antifouling paint liberates copper at

2.115 (1.125) BAITFISH CAN BE KEPT ALIVE LONGER ON HAWAIIAN SKIPJACK TUNABOATS

Baldwin, Wayne J. (Hawaii Institute of Marine Biology, University of Hawaii, Honolulu, Hawaii)
National Fisherman 54, No. 6, 6C-7C, 9C (Oct. 1973)

The baitfish used by the Hawaiian pole-and-line fishery for skipjack tuna is the Hawaiian anchovy or nehu. The baitfish is small and delicate, and it usually dies rapidly in bait wells where it is placed after capture. Experiments with nehu have shown the necessity for making changes in the sampan style of bait well, which will reduce mortalities. The results of the experiments culminated in the design of a 600-gal-capacity prototype bait well with the following improvements: an oxygen addition system, a protein skimmer, raised deck cowling, forced-water exchange system, dispersed lighting, rounded corners, circular water current, central bottom drain, and smooth interior surface painted green and free of obstructions. The experiments showed that introducing pure oxygen into the water was necessary during the first hour of capture to reduce mortalities of the bait fish. The oxygen addition system added to the bait well satisfied this requirement. To maintain the quality of water, a protein skimmer was added in the form of an air supply which released a column of fine bubbles to the surface and formed a foam containing waste organic material. The foam is removed through a drain trough, at the top of the well, with the help of a fine water spray. Placing nehu in brackish water immediately after capture also reduced mortalities. The forced-water exchange system, which is part of the improved design, can be operated as an open or closed system. After starting the baitfish on brackish water, the system can

2.15 SHRIMP SEPARATING METHODS

Lovett, Jack R. (Orange, TX 77630) (pat.)
U.S. Patent 3,750,233 (Aug. 7, 1973)

This invention deals with a method and the apparatus for separating, aboard vessel, combined catches of shrimp and fish. The process applies in particular to shrimp fishing operations where both shrimp and fish are caught in the trawl net. After the net load of shrimp and fish is hauled aboard the boat, electrodes are inserted into the net load and both shrimp and fish are electrocuted. The catch is then dumped into a flotation tank that is part of the sorting machine aboard ship. The shrimp sink to the bottom where they pass through an inclined screen and are removed from the tank by a conveyor. The shocked fish float on the water, and they are removed by inclining the lower portion of the screening tray and dumping the larger fish onto a conveyor. The smaller fish are flushed out of the tank by the continuous flow of water supplied to the tank. The fish are then conveyed to the fishmeal plant (aboard ship) or dumped overboard. FTP

1.89 OCTOPUS AND SQUID. THE SOFT INTELLIGENCE
(9.6)

Cousteau, Jacques-Yves, and Philippe Diolé
Translated by J. F. Bernard
Doubleday & Co., Inc., Garden City, N.Y. (1973), 304 pp. Price $9.95.

This book describes the life history of the octopus and squid, with notes on the Nautilus. In popular language, the authors described the habits of each species and the geographical locations where they are found. Many photographs, in color and in black and white, illustrate the points of the descriptions. In appendix I, the biology and nomenclature of the class Cephelapoda are described with many line drawings. In appendix II, the relationship of the octopus to man is described: as food, as a subject of art, and as a monster of myth. In appendix III, the giant nerve fibers of the squid Loligo, used as a model in the elucidation of nerve action and physiology, are described. An illustrated glossary of terms used, a short bibliography, and an index complete the book. SW

2.11 PLASTIC MATERIALS USED FOR FISHERIES
(2.112)

Honda, Katsuji (Japan)
Chemical Abstracts 79, No. 6, 32526y (Aug. 13, 1973)

2.114 TOXIC METAL FUMES FROM MANTLE-TYPE CAMP LANTERNS

Griggs, Kyle (Lawrence Livermore Laboratory, University of California, Livermore, Calif.)
Science 181, No. 4102, 842-843 (Aug. 31, 1973)

The mantle of camp lanterns contains about 600 μg of beryllium metal. During the first 15-min use of a new mantle, most of the beryllium is volatilized and is airborne. Inhalation of the air in a confined space such as a cabin or camper containing this quantity of beryllium can be hazardous. There are two forms of beryllium disease: the chronic form, which can develop after exposure to low concentrations over a long period of time; and the acute form which can result from a single exposure to a high concentration of beryllium for a short time. The American Industrial Hygiene Association recommends that to prevent the acute form of the disease, concentrations of 25 μg of beryllium per cubic meter of air should not be exceeded. In the process of lighting a lantern with a new mantle, the face of the user usually is in close proximity to the flame, and emissions from the mantle can be inhaled. Users of gas lanterns should be aware of the hazard from the mantle. SW
[1 figure, 1 table, 1 reference]

2.00 (2.19)(1.5)

protein; however, production of DNA in the muscle is accompanied by a corresponding amount of formaldehyde which insolubilized the protein. Hake has a reputation for poor keeping qualities, and those that arrive on trawlers after 3 or 4 days on ice are in poor condition. The presence of DNA in the muscle of the hake can be predicted. If these fish are used for food, the DNA under acid conditions, as in the digestive tract, can combine with nitrites to form nitrosamines which are carcinogenic. For this reason, hake should be stored in a manner that will prevent DNA production.
[2 figures, 10 references] SW

2.115 (1.125)

be operated as a semiclosed system which slowly introduces fresh seawater, as the brackish water in the well is being recirculated, until the seawater is at full strength (after about 3 h). The bottom drain is a feature that permits quick removal of dead fish or other debris quickly without disturbing the nehu. The reduction in mortalities after incorporating these improvements into a bait well are expected to be within the range of 5% to 10%. A plumbing diagram and a cutaway drawing show all the features installed in a bait well.
[5 figures] SW

2.113

a rate greater than 10 $\mu g/cm^2/day$. This release is controlled by the matrix holding the antifouling substance. The test paint containing 61.80% pigment (by weight), with 49.08% cuprous oxide in the pigment, was the most resistant to the fouling organisms.
[3 figures, 2 tables, 31 references] SW

2.3 (9.15) POTENT PYRETHROID INSECTICIDES FROM MODIFIED CYCLOPROPANE ACIDS

Elliott, M., A. W. Farnham, N. F. Janes, P. H. Needham, and D. A. Pulman (Rothamsted Experimental Station, Harpenden, Hertfordshire AL5 2JQ, England)
Nature 244, No. 5416, 456-457 (Aug. 17, 1973)

Pyrethrin I is a very active, natural insecticide against a wide variety of insects. It does not leave persistent residues, and it has low oral toxicity to mammals. Bioresmethrin is a synthetic compound related to pyrethrin I but it is about 50 times more active and less toxic. These two compounds are esters of (+)-trans [IR,3R]-chrysanthemic acid. By modifying the acid side chain in bioresmethrin so that the four carbon atoms in the isobutenyl group are rearranged to a but-1-enyl substituent, the authors have been able to increase the insecticidal activity of the original compound 100 times more than pyrethrin I while retaining low mammalian toxicity. Other changes of the acid side chain in bioresmethrin have further increased insecticidal activity. The primary point in the pyrethrin I molecule for metabolic attack by insects and mammals is the trans (E)-methyl group. The authors experimented with the compound by addition of substituents at this point with the purpose of suppressing a detoxification route. The most active insecticidal substituent obtained was a cis-(Z)-butadienyl side chain. The authors suggest that the insecticidal activity of pyrethrinlike compounds can be increased by small changes in the molecule at sites not directly involved in the poisoning process. The new compounds described in the article are under UK Patent Applications Nos. 24809/72, 24811/72, and 308038/72.
[2 figures, 1 table, 13 references] SW

2.3 APPARATUS FOR REMOVING SHELLS FROM CRUSTACEA

Lapeyre, James M. (New Orleans, LA 70115) (pat.)
U.S. Patent 3,745,609 (July 17, 1973)

The apparatus is used to separate the meat from the shells of crustacea (shrimp, crab, lobster, crayfish). The crustacea shell [parts ?] are dropped onto a rotating disk and then are forced to travel a spiral pathway at increasing speed. The path of the moving crustacea parts is controlled by a volute guide; as the parts move they are subjected to an incising action of knifelike projections in their pathway. Finally, the meat and shells are introduced into a flotation bath for separation; the shells sink, and the meat floats and is skimmed off. FTP

3.15 (2.43) PACKAGING ASPECTS OF IRRADIATED FLESH FOODS: PRESENT STATUS. A REVIEW

Agarwal, S. R., and A. Sreenivasan (Biochemistry and Food Technology Division, Bhabha Atomic Research Centre, Bombay, India)
Journal of Food Technology 8, No. 1, 27-37 (Mar. 1973)

This review of the packaging aspects of irradiated flesh foods covers criteria for selecting suitable packaging materials for radurized and for radappertized foods, the safety aspects of irradiated packaging materials, and the behavior of flexible and rigid containers to ionizing radiation. Radiation treatment of foods is broadly classified into two categories: radurization, involving doses of less than 1 Mrad for extension of the refrigerated shelf life of foods, and radappertization, involving doses up to 4-6 Mrad for long-term storage of foods without refrigeration. The radiation stability of flexible packaging materials is as follows: Polystyrene and polyethylene terephthalate--excellent; Polyamides--good; Polyethylene, polyvinyl chloride, and polyvinylidene chloride copolymer--fair to good; Polypropylene--fair; and Polytetrafluoroethylene, cellophane, and paper--poor. Approved flexible packaging materials for gamma irradiated foods are:

Radurized foods (maximum dose of up to 1 Mrad)

Nitrocellulose coated cellophane; glassing paper; wax coated paperboard; polypropylene film with or without adjuvants; ethylene-alkene-1-copolymer; polystyrene film with or without adjuvant substances; rubber hydrochloride with or without adjuvant substances; vinylidene chloride-vinylchloride copolymer film; polyolefin film with or without adjuvant substances or vinylidene chloride coatings; polyethylene terephthalate with or without adjuvant substances or vinylidene

3.231 SLIDING DOOR SYSTEMS FOR COLD CHAMBERS

Van der Speck, W. (Markus Hermetic Doors Ltd.)
Refrigeration and Air Conditioning 76, No. 903, 29-32 (June 1973)

The greatest advantage of the sliding door for cold chambers lies in the reduced space it requires for opening. The increased use of the forklift truck in warehouse operations necessitated the use of bigger door openings which only the sliding door arrangement could conveniently satisfy. The openings into cold storage areas should not be bigger than necessary. Cold air losses and moisture penetration increase with the size of the door opening. In determining the width and height of a door opening, the size of the forklift truck and its ease of entry must be taken into account. If entry to the door is from a narrow corridor with a corner, then the opening should be wide to allow easier access by the forklift truck. The height of the door opening must be related to the corridor height, also. The requirements that a sliding door must satisfy are as follows: (1) it must have the same insulation value as the chamber walls, (2) a 100% airtight seal on frame and sill, (3) fast opening and closing, (4) ease of maintenance, (5) mechanical strength (to remain intact after being struck by a forklift truck), and (6) simplicity of operation. To seal the door hermetically, a flexible gasket must be applied to the frame and sill. Before the door is slid open, the gasket must be freed from its position to prevent damage to the seal and to ensure that the door slides open easily. Seven systems with diagrams are shown that may be designed into a sliding door to satisfy the requirements listed.
[1 photograph, 7 diagrams] SW

3.12 PRESERVATION OF POMFRET WITH CHLORTETRACYCLINE

Jadhav, M. G., and N. G. Magar (Dep. Biochem., Inst. Sci., Bombay, India)
Chemical Abstracts 79, No. 5, 30569r (Aug. 6, 1973)

[2 tables, 66 references] FTP

is also beneficial for increasing shelf stability.

ting fatty fish to limit oxidative changes; packaging redurized fish under vacuum to be adversely affected. Oxygen must be excluded from the package while irradia-

gas and vapor barrier properties, otherwise the shelf life of the product is likely

The packaging material for irradiation-treated fish products must have good

vants; and vinyl chloride-vinyl acetate copolymer film with or without adjuvants.

ene terephthalate with or without adjuvants; nylon 6 films with or without adju-

Vegetable parchment; polyethylene film with or without adjuvants; polyethyl-

Radappertized food (maximum dose of up to 6 Mrad)

polymer coated cellophane.

chloride coatings or polyethylene coatings; nylon 11; and vinylidene chloride co-

3.15 (2.43)

2.3 PACKAGED SEAFOOD PRODUCTS

Spears, D. S.; Blue Channel Corp. (pat.)
U.S. Patent 3,736,153
Food Technology 27, No. 9, 114 (Sept. 1973)

Seafood products in processing liquid-containing copper or iron ions are packaged in a metallic can lined with aluminum foil; the can and product had been processed by heating. FTP

2.3 APPARATUS FOR EXTRACTING VISCERA FROM FISH

Grimes, Eldon H.; Marine Construction & Design Co., Seattle, Wash. (pat.)
U.S. Patent 3,754,301 (Aug. 28, 1973)

The apparatus is used to remove the viscera from beheaded fish (primarily salmon). Pressure is applied mechanically to the beheaded fish supported flatwise in a horizontal plane; a rolling action progressing from the tail to the head end extracts the viscera. It can operate on fish of varying types, sizes, or condition. It is effective in removing the roe without appreciable damage. FTP

3.2493 LIPID HYDROLYSIS, OXIDATION, AND AGING IN FROZEN FISH

Toyomizu, Masamichi, and Toshihiko Shono (Fac. Agric., Kyushu Univ., Fukuoka, Japan)
Japan)
Chemical Abstracts 78, No. 11, 70262w (Mar. 19, 1973)

2.3 DEEP FAT FRYING

Marmor, R. A.; Pillsbury Co. (pat.)
U.S. Patent 3,733,202
Food Technology 27, No. 9, 119 (Sept. 1973)

This deep fat fryer contains a system for introducing a small amount of moisture into the fat at a point where the fat enters the vessel in order to distill off undesirable fat breakdown products. FTP

3.2343 FOOD FREEZING PROCESS
(3.237)

Knutrud, L. B. (pat.)
Canadian Patent 927,193
Food Technology 22, No. 9, 119 (Sept. 1973)

Frozen fish fillet blocks are produced in a mold placed between freezer plates; the mold has a frame which gives poor heat conductivity between the sides of the fillet block and the freezer plates. FTP

2.3 SHRIMP PROCESSING MACHINE AND METHOD

Jonsson, Gregor (Lake Forest, Ill.) (pat.)
U.S. Patent 3,751,766 (Aug. 14, 1973)

This shrimp processing machine contains an intermittently operating conveyor from which the beheaded shrimp (tails) are grasped (terminal end of tail piece first) and pulled onto a rotary wheel turning at a uniform rate. The shrimp shell and part of the meat are slit; the sand vein is removed by a revolving brush. A mechanism separates the meat from the shell and delivers the meat to a discharge conveyor. FTP

4.21 PRO- AND ANTIOXIDANT EFFECTS OF SOME AMINO ACIDS UPON FISH OIL

Jurewicz, I., and J. Salmonowicz (Sea. Fish. Inst., Gdynia, Poland)
Chemical Abstracts 79, No. 3, 17069h (July 23, 1973)

4.21 EFFECT OF TOCOPHEROL CONCENTRATION IN SOME FISH OILS UPON THEIR OXIDATION

Brzeska, Z., and J. Salmonowicz (Sea Fish. Inst., Gdynia, Poland)
Chemical Abstracts 79, No. 3, 17050v (July 23, 1973)

4.90 (0.7) A FEEDING STUDY OF A USED, PARTIALLY HYDROGENATED SOYBEAN OIL, FRYING FAT IN DOGS

Nolen, Granville A. (Procter and Gamble Co., Miami Valley Laboratories, P.O. Box 39175, Cincinnati, OH 45239)
Journal of Nutrition 103, No. 9, 1248-1255 (Sept. 1973)

In an earlier study, the author and his coworkers showed that certain fats commonly used for deep fat frying of foods (under simulated commercial conditions), had no adverse effect on rats when fed at levels of 15% in their diet for 2 years. In the present study, the author determined the effect of a used frying fat on the dog. Partially hydrogenated soybean oil (iodine value of 107) was selected as a representative frying fat.

"Partially hydrogenated soybean oil (IV 107) was used for deep fat frying under commercial conditions until it reached the end of its useful frying life. This used fat, or a fresh fat control, was fed to two male and two female dogs at levels of 15% in a semipurified diet. Their effects were compared to those of a commercial dog feed from shortly after weaning until the dogs were 54 weeks old. There was no apparent difference in the growth of female dogs fed all three diets. The male dogs fed the diet with used fat grew about the same as those fed the commercial dog feed, but both groups had reduced growth compared to dogs fed the diet with fresh fat. As in the rat studies, this reduced rate of growth for males was attributed to the lower absorbability of the used fat compared to the fresh. Otherwise, histopathological and clinical examinations showed that all of the dogs fed the three diets were in good health."

5.120 ZINC: A TRACE ELEMENT ESSENTIAL IN VITAMIN A METABOLISM

Smith, J. Cecil, Jr., E. G. McDaniel, F. F. Fan, and James A. Halsted
Science 181, No. 4103, 954-955 (Sept. 7, 1973)

Other reports suggest that there is an interrelationship between vitamin A and zinc. In tests to elucidate the relationship, two groups of rats were fed identical diets containing vitamin A, but one diet was deficient in zinc. The rats were fed these diets for 104 days. The results show that vitamin A levels in liver were similar in both groups, but the vitamin A levels in the plasma of the group fed the zinc deficient diet were lower. The authors suggest that vitamin A was not being adequately mobilized from the liver to the plasma in the zinc deficient rats. Further tests were performed to determine the effects of zinc on the mobilization of liver vitamin A. Germ-free rats were fed a diet devoid of vitamin A and zinc for 28 days. This induced symptoms of vitamin A and zinc deficiencies. The rats were divided into two groups: one group was given 80 μg vitamin A orally thrice weekly for 14 days; the other group was given vitamin A similarly plus 200 μg zinc intraperitoneally thrice weekly for 14 days. Plasma, liver, and dietary levels of vitamin A were determined fluorometrically by a method similar to that of J. N. Thompson, P. Erdody, R. Brien, and T. K. Murray [Biochem. Med. 5, 67 (1971)]. In the group fed vitamin A without zinc, liver levels of vitamin A were higher, and plasma levels of vitamin A were lower than in the group given the vitamin and zinc. These results indicate that without sufficient zinc, vitamin A accumulates in the liver and is not mobilized to maintain normal concentrations in plasma. The authors suggest that the results of these experiments indicate that

6.54 FISH PROTEIN

Astra Nutrition AB (pat.)
British Patent 1,313,053
Food Technology 27, No. 9, 114 (Sept. 1973)

Strips of fish flesh are washed and sprayed with water, heated with live steam, and then fed to a separator where the bones and meat are separated. The meat is homogenized and centrifuged to remove fat, soluble substances, and skin fragments. The remaining meat material is dried in preparation for solvent extraction to remove residual fat or undesirable flavors. FTP

6.54 FISH PROTEIN POWDER

Carpenter, Roland Paul, George Main, and Anthony H. Sutton (Unilever N. V.) (pat.)
German Offen. 2,254,614 (May 17, 1973)
Chemical Abstracts 79, No. 5, 30691z (Aug. 6, 1973)

4.90 (0.7)

It was concluded, that partially hydrogenated soybean oil (iodine value of 107) which had been used for deep fat frying of foods was wholesome and nutritious when fed to dogs as 15% of their diet. However, there was some limitation of weight gains, due to the lower coefficient of absorbability for the used fat, but this was not considered harmful.
[2 figures, 10 tables, 11 references] [First and last paragraphs are abstracted; the second paragraph is the author's abstract]

4.91 THE LIPID COMPOSITION OF THE BLOOD OF MARINE MAMMALS--III. THE FATTY ACID COMPOSITION OF PLASMA AND ERYTHROCYTES OF ATLANTIC BOTTLENOSE DOLPHIN, TURSIOPS TRUNCATUS

Nelson, Gary J. (Bio-Medical Div., Lawrence Livermore Laboratory, University of California, Livermore, CA 94550)
Comparative Biochemistry and Physiology 46, No. 2B, 257-268 (Oct. 15, 1973)

This article reports the fatty acid composition of the whole plasma and erythrocytes of Atlantic bottlenosed dolphins. The plasma showed 27% saturated fatty acids, 46% monounsaturated, and 27% polyunsaturated. The erythrocytes showed 33% saturated fatty acids, 33% monounsaturated, and 33% polyunsaturated. The erythrocytes contained 13.3% arachidonic acid and the plasma contained only 2.5%. The iso, anteiso, and multibranched chain fatty acids constituted minor (but significant) components of the fatty acid profile of the plasma, but they were present at markedly lower levels (or not detected at all) in the erythrocytes. The plasma fatty acids showed a typical marine fatty acid profile, reflecting the dietary fat intake of the dolphin. The red cell fatty acids, which are mainly synthesized endogenously, were similar in composition to those of terrestrial animals except that they had lesser amounts of 18-carbon unsaturated fatty acids.
[2 figures, 3 tables, 36 references]

FTP

6.31 [CONTRIBUTIONS TO THE STUDY OF THE BIOLOGY AND CULTIVATION
(6.36) OF SEA-ONION IN ALGERIA]
CONTRIBUTION A L'ÉTUDE DE LA BIOLOGIE ET DE LA CULTURE DE LA SCILLE MARITIME EN ALGÉRIE

Blanchard, M. (INRA, GVES, SNES, La Miniere, Versailles, France)
Agron. Trop. 27, No. 11, 1101-1114 (1972) (In French)
Aquatic Sciences & Fisheries Abstracts 3, No. 6, 27, Abstract No. 3Q5729M (June 1973)

The sea onion is a plant with pharmaceutical properties which include toxicity for rats. The densest growth of the plant are found in Algeria where it has been grown more or less rationally. The biology of the plant is described in the article and includes development stages from sowing, through fructification, to seed production. Technical instructions for cultivation of the plant are also included.

SW

6.61 SEPARATING PROTEINS FROM FISH
Gasser, Rupert Josef, and Lienhard Bodo Huster (Societe des Produits Nestle S.A.) (pat.)
Swiss 528,869 (Nov. 30, 1972)
Chemical Abstracts 78, No. 11, 70464p (Mar. 19, 1973)

5.120

conditions of depressed vitamin A in plasma that do not respond to vitamin A therapy may respond to therapeutic doses of zinc.
[1 figure, 1 table, 8 references]

MS

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6. (1.951) PRODUCTION OF FEED MEAL FROM CASPIAN SEAL CARCASSES

Olenchenko, G. N., and A. A. Magomaev (Dagest. Gos. Univ. im. Lenina. Makhachkala, U.S.S.R.)
Chemical Abstracts 78, No. 23, 146496y (June 11, 1973)

4.11 NEW METHODS
(7.596)

Newman, H. A. I., and Peter E. Braun (compilers)
Journal of Lipid Research 14, No. 5, 602-603 (Sept. 1973)

This bibliography lists 58 selected references to analytical lipid methods published recently (1972 and 1973).

FTP

7.0 SAMPLING TECHNIQUES IN CHROMATOGRAPHY

Karasek, F. W. (Dept. of Chemistry, University of Waterloo, Waterloo, Ontario, Canada)
Research/Development 24, No. 9, 54-57 (Sept. 1973)

The micro sample sizes used in gas and liquid chromatography (GC)(LC) require careful handling to ensure the output of accurate data. The care and technique exercised may be modified depending on whether the objective is qualitative or quantitative analysis. The method widely used to introduce a sample into GC is syringe injection through a septum (a port with flexible plugs and seals). The syringes of one manufacturer range in capacities from 1 µl to 50 ml. Because the GC column head is at elevated pressure and temperature, there are three major sources of improper sample injection: a leaking septum, sample blowback between the barrel and plunger of a worn syringe, and nonuniform volatilization of the sample with retention of heavy components in the needle. The first two problems can be corrected with new replacements; however, sample blowback is not easily recognized. Nonuniform volatilization of the sample requires modification of the technique. Penetration of the septum causes immediate vaporization of the sample contents in the needle leaving less volatile components behind. This problem can be eliminated by first drawing a large volume of solvent into the syringe followed by a small volume of air and then drawing in the sample. This technique is used extensively in pesticide analysis. A port for entry into the column such as a septum, can become worn after 50 to 80 sample injections. A valve arrangement can be used for sample admission many thousands of times. In addition to introducing samples into a column, valves can be used either for backflushing the column, or

7.8 (7.44) COLLABORATIVE STUDY OF THE DETERMINATION OF AMMONIA AS AN INDEX OF DECOMPOSITION IN CRABMEAT

Steinbrecher, Kurt (Food and Drug Administration, 909 First Ave., Seattle, WA 98104)
Journal of the Association of Official Analytical Chemists 56, No. 3, 598-601 (May 1973)

A colorimetric method for the determination of ammonia in crab meat at various stages of quality was examined by collaborators in six different laboratories. The colorimetric method involved the reaction between ammonia, thymol, and alkaline bromine water. The crab meat was allowed to stand at room temperature; at periodic intervals the meat was examined organoleptically and assayed for ammonia content. Statistically significant differences in the ammonia content of the crab meat were found at specific defined stages of decomposition.
[1 figure, 4 tables, 7 references] FTP

7.42 DETERMINATION OF AMMONIA IN AQUARIA AND IN SEA WATER USING THE AMMONIA ELECTRODE

Gilbert, Thomas R., and Alice M. Clay (New England Aquarium, Boston, MA 02110)
Analytical Chemistry 45, No. 9, 1757-1759 (Aug. 1973)

The two widely used methods for the determination of ammonia in sea water have limited applicability to routine analysis because of interference from other nitrogenous compounds, complexities of blank correction or sample contamination, and time-consuming procedures. An analytical procedure which reduced the limitations of the other methods is available, and it uses an electrode for the determination of ammonia in aqueous solutions. The electrode consists of a hydrophobic gas-permeable membrane which separates the alkaline test solution from an internal solution, 0.1M ammonium chloride. A glass pH electrode and a silver-silver chloride reference electrode are immersed in the internal solution.

The authors tested the electrode for reproducibility and accuracy. They found that the relative precision of the analyses was fairly constant over a wide concentration range. In addition, they found the electrode method provides an accurate means of analyzing for ammonia in sea water; it is more precise than the spectrophotometric methods, and it is well suited for field work.
[1 figure, 3 tables, 7 references] SW

7.86 (0.5) A STANDARDIZED REVERSED PASSIVE HEMAGGLUTINATION TECHNIQUE FOR THE DETERMINATION OF BOTULINUM TOXIN

Evancho, G. M., D. H. Ashton, and E. J. Briskey (Campbell Institute for Food Research, Camden, NJ 08101), and E. J. Schantz (Food Research Institute, University of Wisconsin, Madison, WI 53706)
Journal of Food Science 38, No. 5, 764-767 (July-Aug. 1973)

Proper treatment for botulism victims and identification of the implicated food for prompt removal from distribution necessitates rapid detection and typing of botulinum toxin. The currently accepted method is time consuming and has other disadvantages; any method to replace it should be as sensitive and also more rapid. The authors reviewed the literature on the qualitative and quantitative determination of botulinum toxin in foods. One procedure used reversed passive hemagglutination which was the basis for the development of a new test. The new test used the following preparations and procedures. Formalin-preserved sheep erythrocytes (SRBC) were washed and diluted to 2.5% with saline and refrigerated until needed. Antiserum against botulinum type A toxin was prepared by injecting rabbits with toxoid preparations. Antitoxin globulin was prepared from rabbit antiserum by multiple precipitation with ammonium sulfate followed by dialysis to remove the sulfate ions. It was stored frozen until needed. The SRBC were tanned with tannic acid, washed, and resuspended to a 2.5% concentration in saline. The tanned SRBC were sensitized by mixing with antitoxin globulin (prepared earlier) and incubating at 24°-27° C for 10 min. The sensitized cells were centrifuged, washed in phosphate-buffered saline (PBS) containing 0.5% normal rabbit serum (NRS) and resuspended in the same. In the hemagglutination procedure, serial dilutions of

7.0 PREPARING HIGH EFFICIENCY PACKED GC COLUMNS

Leibrand, Roger J. (Scientific Instrument Div., Hewlett-Packard, Palo Alto, Calif.), and Loren L. Dunham
Research/Development 24, No. 9, 32-36, 38 (Sept. 1973)

The authors suggest that by improving the efficiency of GC (gas chromatographic) columns smaller samples can be used in shorter columns at lower temperatures. These improvements can result in better separations and analyses in less time. The authors gave suggestions for improving the efficiency of GC columns. In the area of support variables, the material should have good mechanical strength, be of small, uniform particle size, and be deactivated by thorough washing with HCl. An improved deactivation and vapor silanization technique for GC support material is also given. In the area of liquid phase variables, use of material that is initially liquid, rather than a solid that becomes liquid in the column, increases efficiency; more polar phases form better films and increase efficiency of the column; the thinnest possible film of the liquid phase increases efficiency of the column; degassing the support material improves efficiency; fluidized drying is more efficient than tray drying; and very little conditioning of siloxane phases at high temperature is necessary. An improved technique for solution coating of support material is described. In the area of construction variables, the authors suggest U-shaped columns of narrow bore made of silane-treated Pyrex with an added deactivation treatment. In the area of operating variables, the authors suggest the use of the lowest inlet pressure possible, using helium gas as the best compromise. A very small amount of sample injected in a short period of time is the ideal technique. Calculations are best performed by means of the equations of A. B. Littlewood [Gas Chromatography, Academic Press, New York (1962)].
[5 figures, 17 references] SW

7.86 (0.5)

toxin, toxoid, or toxin-containing samples were prepared (using NRS in PBS as the diluent) in 0.5-ml amounts in tubes. SRBC (prepared earlier) was added to the tubes in 0.05-ml amounts. Hemagglutination patterns were observed in the tubes after incubation for 2 h at 24°-27° C. A parallel series of microtiter tests were run also, with slight modification of the procedures. In tests of food products contaminated with Clostridium botulinum, it was sometimes necessary to add washed SRBC to the samples (followed by washing and centrifugation) to remove substances that caused nonspecific agglutination.

Both the tube and microtiter techniques were found to be successful for toxin detection. The end point for 20 hemagglutination tests with crystalline type A toxin or toxoid was 0.0008 µg/ml using chromic chloride sensitized SRBC (a slight modification of sensitizing SRBC in buffer). This represents a toxin level of about 27 mouse LD_{50}, if one mouse Ld_{50} equals 0.00003 µg. No cross reactions with other types of botulinum toxin, or extracts of foods inoculated with C. sporogenes, occurred with type A antiglobulin sensitized cells. The toxin content of a food extract can be read directly from a standard table that can be set up with this procedure. There was excellent correlation between this technique and the currently accepted mouse assay technique.
[2 tables, 20 references] SW

7.0

sample selection, or detector switching, or concentration techniques. Effective valve operation requires low internal dead volume, no leakage between ports of the valve, reliability over many injection cycles, and resistance to high temperatures. Valves with three to eight ports can be used in 18 different combinations. Valves constructed of tantalum may be used in the analysis of corrosive organic and inorganic samples. Most sampling valves are used in process controls. The devices and methods used in injecting GC samples may be adapted for use in LC.
[4 figures, 15 references] SW

7.8 (3.239) COLLABORATIVE STUDY ON A TEST TO DETERMINE WHETHER SHUCKED OYSTERS HAVE BEEN FROZEN AND THAWED

Gould, Edith (National Marine Fisheries Service, U.S. Dept. of Commerce, Milford, CT 06460)
Journal of the Association of Official Analytical Chemists 56, No. 3, 541-543 (May 1973)

A method, utilizing the differing electrophoretic migration rates of various forms of malic enzyme activity, was tested to discern whether shucked oysters had been frozen and thawed. Normally a soluble form of malic enzyme activity is present in unfrozen oysters; additional latent forms of the enzyme are solubilized by freezing and thawing the tissue, presumably as a result of disruption of the cellular tissue. The method combines polyacrylamide gel electrophoresis and a specific histochemical medium [E. Gould and M. J. Medler, JAOAC 53, 1237-1241 (1970)]. Five laboratories tested the oyster Crassostrea virginica and one tested C. gigas. Four treatment variables were used: fresh-unfrozen; fresh-frozen/thawed; stale-unfrozen; and stale-frozen/thawed. On the basis of malic enzyme enzymograms the various laboratories were able to clearly distinguish between unfrozen oyster meats and those meats that had been frozen and thawed. The method is valid for both species of oysters tested. Apparently, neither autolyses nor bacterial action altered the enzymographic patterns.
[1 figure, 2 tables, 2 references] FTP

7.0 POLYACRYLAMIDE GEL DISC-ELECTROPHORETIC IDENTIFICATION OF FISH (FAMILY GADIDAE) (1.5)

Lozano Simal, J., A. Charro Arias, and E. Alvarez Vega (Fac. Farm., Cons. Super Invest. Cient., Santiago Compostela, Spain)
Chemical Abstracts 79, No. 7, 40126h (Aug. 20, 1973)

8.0 1973-74 INGREDIENT ANALYSIS AND ESTIMATED FEED VALUE TABLES FOR BEEF AND SHEEP GROWING-FINISHING RATIONS

Morrison, S. H. (Agricon, Claremont, Ontario, Canada)
Feedstuffs 45, No. 37, A:5, 7, 9, 12, 14, 16, 18, 20 (Sept. 10, 1973)

This report consists primarily of two tables. The first gives the average analyses for common feed ingredients; these analyses include dry matter, crude protein, fat, fiber, nitrogen-free extract, calcium, phosphorus, total digestible nutrients, digestible protein, and estimated net energy. The author suggests that the nutritionist and feedyard owner should use the values in the table only as guides for calculating feedlot rations for fattening lambs and cattle.

The second table represents an attempt to estimate the feed "value" for various ingredients as "grain" replacements for No. 2 yellow corn, and/or as "protein" replacements for 45% protein grade solvent soybean meal. The data represent the practical results obtained by feedlot operators with the various feed ingredients.

For information on how to obtain copies of these ingredient analyses and feed value tables write to the Reader Service Dept., Miller Publishing Co., P.O. Box 67, Minneapolis, MN 55440. FTP

9. (9.6) COASTAL ZONE BIBLIOGRAPHY: CITATIONS TO DOCUMENTS ON PLANNING, RESOURCES MANAGEMENT AND IMPACT ASSESSMENT

Sorensen, Jens, and Marie Demers (University of California)
Sea Grant Publication No. 8, IMR TR-43, Institute of Marine Resources, University of California, P.O. Box 1529, La Jolla, CA 92037 (ed. 1) (Aug. 1973), 89 pp.

This computer automated bibliography of 1,167 references was prepared as support to the University of California Sea Grant Research Project. The objective of the research project is to develop methods to assess the environmental and socioeconomic impacts of coastal development and resource use. The impact assessment method that is being developed involves the construction of networks and checklists to systematically identify the potential environmental and socioeconomic impacts that may be generated by a proposed coastal development or resource use. The intent of this bibliography is to provide documentation of the actual occurrence of and the research reports on each of the potential impacts identified by the networks and checklists. A complete description of the environmental impact assessment method and the relation to computer automated bibliographies may be found in "Procedures and Programs To Assist in the Environmental Impact Statement Process" by J. C. Sorensen and Mitchell Moss (Available from the Sea Grant Offices at the University of Southern California or University of California, San Diego, Calif.). FTP

9. (1.83)(1.017) COMPETITION BETWEEN SEA URCHINS AND ABALONE

Shepherd, S. A. (South Australian Dept. of Fisheries, Adelaide, Australia)
Australian Fisheries 32, No. 6, 4-7 (June 1973)

Fishable abalone stocks may be displaced by sea urchins because of ecological imbalance in the southeast coast of Australia. This competition may partly be due to the manner in which they feed. The sea urchin grazes on the seaweed nonselectively and crops it close to the supporting ground and rocks. When concentrations of sea urchins are high, grazing may be excessive and cause areas of rock to become barren of seaweed and other growth. On the other hand, the abalone feeds on the same plants as the sea urchins but grazes selectively and does not crop closely. The reduction of the plant resources by the sea urchin places the abalone at a competitive disadvantage, that is, unable to maintain its population level. The sea urchin then displaces the abalone, if other ecological conditions are not altered. Overfishing of the abalone can contribute to these conditions. Increased growth of seaweed results from the reduced abalone population and makes more food and shelter available for the sea urchin. This can cause an additional decline of the abalone population because of the reduction in its food and shelter. These views are corroborated by the history of the lobster fishery in St. Margaret's Bay, Nova Scotia. There, lobsters were the main predators of sea urchins which graze on seaweed. Overfishing the lobster stocks caused a population explosion of the sea urchins which in turn overgrazed the seaweed forests--the basic producer of the

9.11 (1.8) ACCUMULATION OF FOSSIL CO_2 IN THE ATMOSPHERE AND THE SEA

Fairhall, A. W. (Institute of Nuclear Sciences, Lower Hutt, New Zealand)
Nature 245, No. 5419, 20-23 (Sept. 7, 1973)

The high consumption of fossil fuels has resulted in the increased concentrations of CO_2 in the atmosphere and the oceans. A mathematical model was prepared which could be used to account for the increased concentration of CO_2 in the biosphere and to predict trends and phenomena not previously observed. This model is based on the premise that the land part of the biosphere (on which green plants live) is insufficient to be a major absorber of increased atmospheric CO_2; consequently, the oceans are selected to be the major site for the absorption of CO_2. In models prepared by other workers, the amount of CO_2 that can be absorbed by the mixed layer of the oceans is small. The author's model accounts for increased absorbtion of CO_2 in the oceans by dividing them into areas supersaturated with CO_2 (the tropical Pacific) and areas undersaturated with CO_2 (the North Pacific). The supersaturated water can increase absorption of CO_2 because of contact with the increased CO_2 concentration in the atmosphere; the undersaturated water can absorb CO_2 by diffusion from the burden of CO_2 in the mixed layer of water. The chemical reaction by which CO_2 is absorbed into seawater could cause the concentration of calcium carbonate to go from supersaturated to unsaturated. Seawater with an unsaturated concentration of calcium carbonate would cause the shells of calcareous organisms to dissolve including the coral reefs. The model predicts that the additional amount of CO_2 to produce this reduced concentration of calcium carbonate will have accumulated in seawater by the year 2008, if the current growth of fossil

9. (1.83)(1.017)

ecosystem. This led to a further decline in the lobster stocks. The author suggests that removal of sea urchins from the areas of overgrazed, barren rocks in southeastern Australian waters will result in reestablishment of seaweed followed by an increase in the abalone population.
[3 figures, 3 photographs, 4 references] SW

9.11 (1.8)

fuel consumption continues. The author suggests that the proposed model is twice as accurate as previous models, and the trend of increased concentration of CO_2 in seawater should be detectable in 3 to 5 years. If the trend is confirmed, the author concludes that there will be very little time left to consider what can be done about it. However, the author further suggests that if the calcareous organisms can build shells in undersaturated concentrations of calcium carbonate and if the shells remain undissolved during the lifetime of the organism, then the predictions of the model may be discounted.
[4 figures, 15 references] SW

9.12 LIFE BETWEEN TIDEMARKS ON ROCKY SHORES
(9.6)

Stephenson, T. A., and Anne Stephenson
Published by W. H. Freeman and Co., San Francisco, Calif. (1972), xii + 425 pp.

In the introductory chapter of the book, the terminology and the geographical features of tidal, rocky-shores are defined. The next five chapters cover shores and shore organisms relative to physical limitations of cold, temperate, and tropical climates. The authors apparently had a wide knowledge of Bermuda since they covered its shorelands in a chapter devoted exclusively to that island. In one chapter, the shores of the south, central west, and central east coasts of Africa are described. Both coasts of North America are covered in two chapters; the coast of Chile is included in the chapter on the Pacific coast. Australian and New Zealand shorelines are included in one chapter on Australasia, and the last region described is the British Isles. Each chapter is concluded with a list of references. The book includes an index of authors, an index of genera and species, and a general subject index. SW

8.53 CHANGE OF THE FATTY ACID COMPOSITION OF CARP MUSCLE LIPIDS
(1.92) DURING VARIOUS METHODS OF TREATMENT

El-Bastavizi, Mohamed A., and G. A. Smirnova (Mosk. Inst. Nar. Khoz. im. Plekhanova, Moscow, U.S.S.R.)
Chemical Abstracts 78, No. 9, 56625k (Mar. 5, 1973)

8.53 STEREOCHEMICAL STUDIES OF ACYCLIC ISOPRENOID COMPOUNDS. III. STEREOCHEMISTRY OF NATURALLY OCCURRING (MARINE) 2,6,10,14-TETRAMETHYLPENTADECANE

Cox, R. E., J. R. Maxwell, R. G. Ackman, and S. N. Hooper (Sch. Chem., Univ. Bristol, Bristol, England)
Chemical Abstracts 78, No. 5, 30023n (Feb. 5, 1973)

9.10 CALIFORNIA COOPERATIVE OCEANIC FISHERIES INVESTIGATIONS
(9.4)

Anonymous
Marine Research Committee, Dept. of Fish and Game, State of California (June 1, 1972), 150 pp. Inquiries concerning the report should be addressed to the State Fisheries Laboratory, California Dept. of Fish and Game, 350 Golden Shore, Long Beach, CA 90802.

The cooperating agencies for these investigations are: California Academy of Sciences; California Department of Fish and Game; Stanford University, Hopkins Marine Station; University of California, Scripps Institution of Oceanography; and the National Oceanic and Atmospheric Administration, National Marine Fisheries Service. The report is organized into three sections. The first section consists of a review of the administrative and research activities during the period July 1970 to June 1971, a description of the fisheries, and a list of publications resulting from the program. The second section contains seven papers presented at the symposium, "Pollutants and Contaminants in the California Current System" held Nov. 1970. The third section consists of 13 papers dealing with the distribution of pollutants and contaminants in the marine environment, the processes controlling their distribution, and their effects on marine organisms. FTP

9.13 EFFECTS OF SUBLETHAL AMOUNTS OF CADMIUM AND MERCURY ON THE METABOLISM OF ZINC-65 BY FRESH WATER FISH

Merlini, Margaret, F. Argentesi, A. Brazzelli, B. Oregioni, and G. Pozzi (CCR, Ispra, Italy)
Chemical Abstracts 79, No. 5, 29006y (Aug. 6, 1973)

9.11 (1.22)(1.33) COHERENCE IN TRANSPACIFIC MOVEMENTS OF POSITIVE AND NEGATIVE ANOMALIES OF SEA SURFACE TEMPERATURE, 1953-60

Favorite, Felix (National Marine Fisheries Service, NOAA, 2725 Montlake Blvd. East, Seattle, WA 98112), and Douglas R. McLain (National Marine Fisheries Service, NOAA, c/o Fleet Numerical Weather Central, Monterey, CA 93940)
Nature 244, No. 5412, 139-143 (July 20, 1973)

Studies of the relationship between the oceanic distribution of fishes, such as the Pacific salmon, and their environment requires marshalling huge amounts of observations collected by independent research vessels and cooperating commercial vessels which have passed through the ocean area under investigation. The authors were charged by the American Section of the International North Pacific Fisheries Commission to summarize environmental investigations in the central part of the subarctic Pacific region (transpacific north of 40° N.) for 1960-72. Data before 1940, between 1940-47, and between 1948-67 were assembled and programmed for computer analyses. Monthly data between 1948 and 1967 are reasonably complete in 5° by 5° quadrangles; the anomalies used in this report are based on monthly and annual mean values for this 20-year period.

Sea surface temperatures in the subarctic Pacific region are quickly altered because of the succession of climatic changes. Charts of surface temperatures taken at 10-day or monthly intervals may show disordered variability. On the other hand, when approximately 2 million observations are analyzed by computer in 5° by 5° quadrangles, maximum, minimum, and anomalous temperatures are revealed in interesting patterns. Analyses of mean annual values of sea surface temperature between 1953 and 1960 showed an orderly west to east displacement of the maxima of the

9.11 DEEP-SEA SPECIES DIVERSITY: DECREASED GASTROPOD DIVERSITY AT ABYSSAL DEPTHS

Rex, Michael A. (Dept. of Biology, University of Massachusetts, Boston, MA 02116)
Science 181, No. 4104, 1051-1053 (Sept. 14, 1973)

The continental slope varies in depth between 200 and 2,000 m; the abyssal rise lies at depths between 2,000 and 4,000 m. The environments at these depths have been reported to support very diverse benthic communities. No studies have been reported on species diversity on the abyssal plain (below 4,000 m), the deepest and largest benthic region. To determine comparative gastropod diversity, samples were collected from 24 stations along a transect which varied in depth between 70 and 4,970 m. The total number of species collected was 136, distributed among 9,034 individuals. Only specimens taken alive were used in the comparison. The methods used to compare species diversity among the samples were those of: R. H. MacArthur [Amer. Natur. 102, 243 (1968)]; E. C. Pielou [An Introduction to Mathematical Ecology, Wiley, New York (1969)]; and S. H. Hurlbert [Ecology 52, 577 (1971)]. The diversity indexes of E. H. Simpson [Nature 163, 688 (1949)]; L. Brillouin [Science and Information Theory, Academic Press, New York (1962)]; R. P. McIntosh [Ecology 48, 392 (1967)]; and E. W. Fager [Amer. Natur. 106, 293 (1972)] were also applied. The density of organisms along the transect of the upper continental slope varied between 6,000 and 23,000 per square meter (m^2); it dropped to 1,500 to 3,000 per m^2 on the lower continental slope. The density decreased to 500 to 1,200 per m^2 on the abyssal rise and to 31 to 270 per m^2 on the abyssal plain. With the decrease in density with depth, there was no change in species diversity except for

9.12 (1.12)(1.9) FINAL REPORT OF THE WORKING PARTY ON TUNA AND BILLFISH TAGGING IN THE ATLANTIC AND ADJACENT SEAS

Anonymous
FAO Fisheries Reports, No. 118, Supplement 1, 37 pp. (Sept. 1972) (Rome, Italy)

Card A

The Working Party for tuna tagging in the Atlantic and adjacent seas was formed according to recommendations made during the second session of the FAO Expert Panel for the Facilitation of Tuna Research, in Tokyo, Aug. 15-21, 1966. The panel also recommended: work be confined to yellowfin, bluefin, and skipjack tuna, and albacore; research into the efficiency of different tags; the plastic tag of the Inter-American Tropical Tuna Commission be used as a standard for comparison.

At its third session in Cadiz, Spain, Oct. 7-10, 1969, the panel made the following recommendations: to include billfishes, to add total catch data in reports of tag returns, to perform additional research on more efficient tags, to set up guidelines for use of the most efficient tags; and to make uniform rewards for return of tags.

The Working Party prepared an interim report (Mather et al., 1969) which was published in the report of the Third Session of the panel (FAO Fish. Rep. No. 80, pp. 50-69). At the fourth session of the panel the Working Party was disbanded.

This final report is a review of tagging results up to Oct. 1971. Small bluefin had been tagged in large numbers. The recaptures of these tuna indicated several migration routes and areas of heavy exploitation. Large bluefin tuna had been tagged in more localities than the small ones. Migration routes between North

9.12 (1.12)(1.9) FINAL REPORT OF THE WORKING PARTY OF TUNA AND BILLFISH TAGGING IN THE ATLANTIC AND ADJACENT SEAS

Anonymous
FAO Fisheries Reports, No. 118, Supplement 1, 37 pp. (Sept. 1972) (Rome, Italy)

Card B

Cooperating sport fishermen have tagged 672 blue marlin in the northwest Atlantic from 1955 to 1971. Five were recaptured. The stocks of blue marlin have been declining due to heavy longline fishing, and they should be more closely observed by tagging. Sailfish have been tagged by sport fishermen in the western North Atlantic. The majority were captured near the release area. Some seasonal migration was observed.

Two types of tags are being investigated: the Floy FT-1 and the WHOI type "H." Information will be gathered relative to tagging various size fish from purse seine and longline catches. It is preferable to tag small tunas from hook and line catches and large ones fron net catches. Swordfish should be tagged swimming free.

A bibliography of tuna and billfish tagging and maps of migratory tendencies of both species are included.
[5 figures, 11 tables]

SW

9.11

that on the abyssal plain. The diversity of organisms was found to be low on the continental shelf. A fairly uniform, high diversity then decreased with increasing distance out onto the abyssal plain. The author concluded that the data agree with other reports which attributed increased diversity below the continental shelf to increased environmental stability. Decreased diversity on the abyssal plain may result from low productivity.
[2 figures, 1 table, 19 references] SW

9.12 OPTIMAL FISH CRUISING SPEED

Weihs, D. (Dept. of Applied Mathematics and Theoretical Physics, University of Cambridge, Cambridge, England)
Nature 245, No. 5419, 48-50 (Sept. 7, 1973)

Various species of fish make long-range migrations for feeding and spawning purposes. Long distances in the migrations are covered without food intake, and efficient use of stored body energy would be beneficial to the fish. Using mathematical analysis, the author demonstrated that by regulating the swimming speed the performance and efficiency of the fish can be increased. Such information can be useful to fishermen in tracking and locating fish. The mathematical equations showed that, in terms of kinetic energy as a proportion of a given total energy store, the fish swim more efficiently if the speed through the water is maintained at about one fish length per second. The author concludes that the extent of a migratory route could depend upon the size and species of fish involved.
[1 figure, 15 references] SW

9.11 (1.22)(1.33)

temperature for this period beginning off the coast of Japan in 1955 and reaching the west coast of North America in 1957. The transpacific movement of a layer of warmer water generally advanced at a speed of 5 km/d. This continuity of oceanic conditions is confirmed by recent evidence that eddies breaking off from the Gulf Stream have maintained their integrity for several months and sometimes up to a year. The biological implications of being able to forecast the locations, in time and space, of such warm or cold areas in the ocean are many. Data on the sea temperature in the quadrangle off the Queen Charlotte Islands showed abnormally warm winter conditions which coincided with the 1953 and 1958 year-classes of herring. These fish overwhelmingly dominated the herring fishery of southeastern Alaska for 5 and 4 years, respectively.

The authors suggest that their data confirm the possibility of a high order of coherence in a generally turbulent oceanic regime. They hope that this information will stimulate support for acquiring additional oceanographic data to further elucidate conditions and processes in the North Pacific gyre.
[4 figures, 2 tables, 17 references] SW

9.12 (1.12)(1.9)

America and European coasts were found but identity of stocks in relation to migration routes was not found.

Tags recovered from albacore recaptures indicated a seasonal migration route northward along the west coast of Portugal to southwest of Ireland and then into the Bay of Biscay. There have been meager returns from yellowfin tuna tagging. Sustained tagging in the Gulf of Guinea is suggested for gaining information on this species. Blackfin tuna tagging between 1959 and 1961 indicated Cuban waters to be the location of recapture. A Cuban tagging program conducted in 1970 may yield more information. There have been no returns from 231 releases of bigeye tuna in various parts of the Atlantic Ocean.

After 4,000 releases and 90 returns between 1961 and 1970, very little is known about migrations or populations of skipjack tuna. The releases were made off the coasts of Cuba. No movement outside this area was found. None of the fish tagged in the Cape Cod-Cape Hatteras area were recaptured elsewhere.

Of 264 broadbill swordfish tagged in the Cape Hatteras-Grand Banks area in the years 1961-1971, 15 were recaptured in the same area. Over 8,400 white marlin had been tagged, and 103 returns were obtained. Most releases were made between Cape Hatteras and Cape Cod in the summer, and 89 returns were obtained. These returns indicated a migration at the end of the summer; marlin move toward midocean, then southward to a wintering area off the northern coast of South America.

Continued on Card B

9.15 SPAEROMYXA MAIYAI SP. N. (PROTOZOA: MYXOSPORIDEA), COELOZOIC PARASITE OF THE PACIFIC TOMCOD, MICROGADUS PROXIMUS

Morrison, N. Donald, and Ivan Pratt (Dept. of Zoology, Oregon State University, Corvallis, OR 97331)
Journal of Protozoology 20, No. 2, 214-217 (1973)

During the course of a survey of parasitic infections of offshore marine fish of Oregon, the authors noted that a large percentage of adult Pacific tomcod harbored a coelozoic myxosporidian of the genus Sphaeromyxa. This new species, Sphaeromyxa maiyai sp. n. (Myxosporidea: Myxiidae), obtained from the gall bladder of the fish, is described in this report.
[8 figures, 14 references]

FTP

9.16 GROWTH OF GREEN AND LOGGERHEAD SEA TURTLES IN GEORGIA ON NATURAL AND ARTIFICIAL DIETS

Stickney, Robert R., David B. White, and Daniel Perlmutter (Skidaway Institute of Oceanography, Savannah, GA 31406)
Bulletin of the Georgia Academy of Science 31, 37-44 (Jan. 1973)

Loggerhead sea turtles (Caretta caretta) occur in the coastal waters of Georgia. The green sea turtle (Chelonia mydas) is rare to this area but it has been found between latitudes 35° N. and 36° S. In the present tests, loggerhead sea turtles and green sea turtles were reared for several weeks following hatching on diets consisting of either commercial trout-feed pellets, frozen fish, a combination of pellets and frozen fish, or frozen ground crab scraps. An indoor running saltwater system was used for rearing the turtles. The results indicated that green sea turtles can be reared on commonly available pelleted feed at least through the first few months of life. Their growth was similar on all the diets except on that of the crab scraps, on which growth was poor. The loggerhead sea turtles showed poor growth on pellets as compared with their growth on other diets. Apparently, the loggerhead sea turtle needs a diet high in animal protein and other animal ingredients for proper nutrition. It is likely that lack of vitamins or minerals may have been a factor in the poor growth response of the loggerhead sea turtles. Also, the difference in growth responses between the two species may be related to the fact that the green sea turtle is herbivorous after the first year of life and the loggerhead sea turtle is strictly carnivorous.
[2 tables, 3 references]

FTP

9.16 HYGIENE IN NEW ZEALAND TROUT HATCHERIES

Hewitt, G. C. (Zoology Dept., Victoria University, Wellington, New Zealand)
Fisheries Technical Report, No. 86, New Zealand Marine Dept., Wellington, New Zealand (1972), 12 pp.

The objective of this report is to help hatchery organizations reduce the possibilities of infections. Parasites are associated with all wild animal populations. Where animals are introduced into a new habitat without the majority of their parasites being introduced with them, mortalities will be low. Additionally, parasites which normally are relatively harmless may cause high mortality of the host under conditions of high temperature or salinity, lack of food or oxygen, and crowding. The most likely sources of initial infection in probable order of risk are (1) the introduction of diseased fish to the hatchery, (2) contamination of the water supply by diseased fish, birds, or snails, (3) disease carrying eggs, (4) contaminated equipment for handling fish and eggs, and (5) disease organisms carried into the hatchery on vehicles or footwear. To decrease the risk of initial infection all stock should be brought into the hatchery as eggs, water supplies should be from underground sources (clean, and free of other fish and snails), open ponds and raceways should be protected from fouling by birds, used equipment from other hatcheries should be prohibited, packages of eggs should be shipped between hatcheries in nonreturnable containers, water runoff into ponds should be prevented, and vehicles used for transportation of fish between hatcheries should be washed down with a 4% free-chlorine solution. In the course of an unavoidable infection, often there is a slow buildup in the stock over 2 or more years with a slow buildup of mortality; then a sudden mass mortality occurs when either a critical level in

9.16 TECHNIQUES AND INSTRUMENTATION TO CONTROL SOME ENVIRONMENTAL FACTORS FOR SHELLFISH NUTRITIONAL STUDIES

Dwivedy, Ramesh C. (University of Delaware)
Bulletin No. 403, College of Marine Studies, University of Delaware, Newark, DE 19711 (Sept. 1973), 29 pp. Price not given.

The purpose of this work was to develop techniques and instrumentation for feeding oysters under controlled environmental conditions. This bulletin describes the instrumentation for positive control over factors of light intensity, feed density, light to dark ratio, flow rate, and flow volume for nutritional studies of oysters in a recirculating system. The instrumentation and techniques are also adaptable for feeding studies of oysters using radioactive tracers to determine acceptance, rejection, and utilization levels of a given feed by the oyster. The authors indicate that the techniques and instrumentation, with slight modification, can be used to study the feeding of any shellfish.
[8 figures, 7 references]

FTP

9.16 THE USE OF ION SPECIFIC ELECTRODES FOR CHEMICAL MONITORING OF MARINE SYSTEMS. PART ONE. THE AMMONIA ELECTRODE AS A SENSITIVE WATER QUALITY INDICATOR PROBE FOR RECIRCULATING MARICULTURE SYSTEMS

Srna, Richard F., Charles Epifanio, Michael Hartman, Gary Pruder, and Ann Stubbs
Sea Grant Publication No. DEL-SG-14-73, College of Marine Studies, University of Delaware, Newark, DE 19711 (June 1973), 20 pp. Price not given.

A Sea Grant project at the University of Delaware involves the study of growing shellfish in a recirculating system. As part of the project, certain analytical techniques are being evaluated to determine their usefulness in mariculture. The present study concerned the evaluation of the ammonia ion specific electrode for use in monitoring water quality and biological activity in the recirculating water system used in mariculture. In order to assess the usefulness of the ammonia electrode for monitoring water quality, two recirculating systems and one flow-through system containing Delaware Bay water were tested. The researchers found that the ammonia electrode tested was precise and was easy to use for monitoring the ammonia level in a closed system. Furthermore, the ammonia level could be used as a master variable to detect rapid system changes involving physical and biological perturbations.
[4 figures, 4 tables, 4 references] FTP

9.16 COASTAL AQUACULTURE IN THE INDO-PACIFIC REGION

Pillay, T. V. R. (editor) (Dept. of Fisheries, FAO, Rome, Italy)
Published by Fishing News (Books) Ltd., 110 Fleet St., London EC4A 2JL, England. (1972), xiii + 497 pp. Price: £8.00.

This book is a collection of papers and abstracts of papers, presented at the Indo-Pacific Fisheries Council Symposium on Coastal Aquaculture held in Bangkok, Thailand, 18-21, November 1970. Based on a review of the papers presented, the editor suggests that seed production and preparation of inexpensive feeds are areas of aquaculture that need further development. Site selection, design of installations, indigenous species in culture, controlled breeding, and environmental problems were also considered to be important. The first section of the book deals with the status and problems of aquaculture in the countries and regions included in the designation Indo-Pacific. These are: Australia, Japan, Republic of Korea, Malaysia, the Philippines, Taiwan, Thailand, the United States, Vietnam, Eastern India, Ceylon, and Kerala State (southwest India). The second section covers the biology and taxonomy of some culturable species, including finfish and prawns. The third section includes papers on controlled breeding and egg production of fish, mollusks, and prawns. The fourth and fifth sections include the aquaculture techniques reported on shellfish and fin-fish. The sixth section on pests and predators consists of only one report. The seventh section covers selection of sites for aquaculture operations and methods of pond construction. The final section reports on economic trends of aquaculture in the Philippines. There are many photographs and graphs accompanying the text to illustrate the aquaculture techniques described in the discussion. The complete reports are followed by bibliographies. SW

9.15
(9.6) DISEASES OF FISHES

Van Duijn, C., Jr.
Published by Charles C. Thomas, Springfield, Ill., 3rd Edition (1973), 372 pp. Price not given.

This book is a review of the main causative agents of fish diseases and the drugs necessary for the treatment of the diseases. It may be used as a reference source by pond keepers, fish breeders, and those who maintain aquariums. The following subjects are covered: skin infections and parasites, diseases of the gills, sporozoan-caused diseases, viral and bacterial diseases, eye diseases, diseases of internal organs, tumors, other complaints, and medicines. Each chapter is followed with a bibliography, and there is a subject index. SW

9.16

the infection or environmental stress appears. To prevent disease buildup, stress in the fish population must be reduced by following good practices such as beginning with strong healthy parent fish, careful feeding, clean, well-oxygenated water supplies, and maintaining a proper balance between number of fish, water flow, water temperature, and oxygen content of the water. Larval stages and spores of parasites or infectious bacteria should be killed through periodic cleaning of ponds and raceways. Buildups of food wastes and feces must be avoided. Facilities should be resurfaced annually. Disinfection methods should be reasonably inexpensive and not contribute to poisoning the fish stocks. Cleansing of gear should be by dipping into a bucket of concentrated sodium chloride or potassium permanganate and then rinsing off in clear water. Steam cleaning of equipment can be effective only at temperatures between 115°-130° C. Scrubbing surfaces with a solution of at least 2% free chlorine is effective, but they must be rinsed off thoroughly before fish come into contact with them. Should serious disease strike a hatchery, eradication will be facilitated by keeping records of water quality, feeding, entry of new stock, and any other pertinent events.
[12 references] SW

9.15 SODIUM SALT (2,4-D) RELATED TO EMBRYO AND LARVAL (1.92) DEVELOPMENT OF CARP

Matlak, O. (Exp. Farm Lab. Water Biol., Pol. Acad. Sci., Golysz, Poland)
Chemical Abstracts 79, No. 7, 39108x (Aug. 20, 1973)

9.16 PRE-CONDITIONING PROCESS FOR INDUCED SPAWNING

Moe, Martin A., Jr. (Juno Isles, Fla.), and Jay P. Dunathan (Tequesta, Fla.); Oceanography Mariculture Industries Inc. (Riviera Beach, Fla.) (pat.)
U.S. Patent 3,741,158 (June 26, 1973)

This invention involves a process for the preconditioning of fish in preparation for induced spawning. Brood stock of fish (for example, pompano) from the natural environment is isolated in a controlled environment where water quality, temperature, and light are selectively controlled. By maintaining and ajusting the proper environmental conditions the spawning capability and sexual maturity of the fish are controlled. The process is of interest in aquaculture or fish farming operations as a means of stabilizing fish farming output or for controlling the timing of maximum production with optimum marketing conditions. FTP

9.16 FISH HUSBANDRY SYSTEM

Buss, Keen W., and Richard E. Speece; Marine Protein Corp. (New York, N.Y.) (pat.)
U.S. Patent 3,756,197 (Sept. 4, 1973)

This invention describes a high intensity system for raising of fish in one or more series-connected tanks. FTP

9.16 (1.81) ROCK OYSTER SPAT CATCHING PROGRAMME 1971-72

Curtin, L.
Fisheries Technical Report No. 110, New Zealand Ministry of Agriculture and Fisheries, Wellington, New Zealand (1973), 48 pp.

Sticks made of various materials were set out in an estuarine area to determine which would be most suitable as oyster spat collectors. The size of tarred hardwood sticks was 183 cm × 2.5 cm × 2.5 cm; that of asbestos cement sticks was 122 cm × 5 cm × 0.65 cm; and that of reinforced concrete sticks was 122 cm × 2.5 cm × 2.5 cm. The sticks were assembled into racks and set out in the Huawai Bay-Mahurangi River area. The results indicate that all the sticks received satisfactory settlement of oyster spat. In experiments to determine the best rack configuration, one type had 8 layers of 4 sticks and the other had 10 layers of 3 sticks. All racks were 30 cm wide, and the sticks were of asbestos cement. They were then set out in the water for trials. The racks of the second configuration were found to have the most spat settlement. These racks also remained clean of debris. In another experiment, 90 asbestos cement sticks were set out each week from September 1971 to March 1972 to test settlement of spat through the spring and summer (of the antipodes). The results indicated that the sticks set out in the period mid-December to mid-January (summer) received the maximum spat fall. Sticks set out earlier were encrusted by species of Membranipora and Waltersipora (tufted mosslike colonies) which appeared to inhibit oyster spat settlement. Sticks set out in February and March received low densities of spat settlement. Sticks made of various materials were tested for suitability as spat collectors. The following materials

9.17 (1.92) VULNERABILITY AND SURVIVAL OF YOUNG CONNECTICUT RIVER FISH ENTRAINED AT A NUCLEAR POWER PLANT

Marcy, Barton C., Jr. (Essex Marine Laboratory, Essex, CT 06426)
Journal of the Fisheries Research Board of Canada 30, No. 8, 1195-1203 (Aug. 1973)

This report is a result of the Connecticut River Ecological Study performed by the Connecticut Yankee Atomic Power Company in fulfillment of the construction permit granted by the State. Samples of fish and fish larvae were collected at stations located at various points along the discharge canal of the plant and the river. Observations of the samples that were collected indicated most of the fish and larvae that passed through the cooling water system of the power plant were dead by the time they reached the end of the discharge canal. During June and July, when the nonscreenable fish were abundant near the intake of the cooling system, about 80% of the mortality in the canal resulted from mechanically caused injury. About 20% of the mortality was attributed to heat shock and exposure to temperatures above 28° C. The use of sodium hypochlorite as a biocide in the system did not increase mortality. Of the numbers of nonscreenable living fish passing by the plant intake in the river, only about 4% (average) were entrained into the cooling system network. Natural mortality is high in prolific species. For example, the survival rate from egg to adult stages for the American shad in the Connecticut River is estimated to be 0.001%. Entrainment deaths add to the total rate of natural mortality. Screening out eggs and larvae to prevent entrainment would be of no benefit; a report of other work indicated that impingement of striped bass eggs and larvae on fine mesh screening was fatal. A precise evaluation of the impact of entrainment of 4% on the ultimate population of adult fish

9.16 (1.81)

were satisfactory in descending order: tarred hardwood, hardboard "A," acrylonitrile butadiene styrene, hardboard "B," aluminum, and polyvinyl chloride.

The tests were standardized by erecting the racks at three levels intertidally; bunches of sticks were set out in the same manner for comparison. In determining the effectiveness of spat settlement, counts of the subsequently hatched young oysters were made with the unaided eye after lightly scrubbing the sticks. The report contains many photographs of the racks set out in tidal flats and illustrations of sticks covered with oysters at various stages of growth.
[53 plates, 13 tables] SW

9.16 HYDROCHEMICAL CONDITION OF PRODUCTION AND FRY PONDS

Fridman, A. Kh., and E. V. Kozhokaru (U.S.S.R.)
Chemical Abstracts 78, No. 20, 128313g (May 21, 1973)

9.17 (1.92)

is not possible until more information is available on (1) the natural mortality of the life stages of the various species, (2) the capacity of the river environment to support fish populations, and (3) the proportion of the entire population of each species that are subject to entrainment.
[2 figures, 4 tables, 13 references] SW

9.17 VORSCHLÄGE ZUM SCHUTZ DER FISCHEREI BEIM GEWÄSSERAUSBAU
[SUGGESTIONS FOR THE PROTECTION OF FISHERIES DURING THE REGULATIONS OF THE WATERS (DURING STREAM CONTROL)]

Elster, Hans-Joachim (Konstanz-Egg), D. Patrik Huber (Düsseldorf), Edmund Rehbronn (Starnberg), and Otto-Karl Trahms (Düsseldorf) (Arbeitsgemeinschaft der Deutschen Fischereiverwaltungsbeamten und Fischereiwissenschaftler)
Archiv für Fischereiwissenschaft 24, No. 1, 1-28 (Mar. 1973) [In German; Preface in English]

9.16 (1.81)

CONSTRUCTION AND REHABILITATION OF COMMERCIAL OYSTER REEFS IN FLORIDA FROM 1949 THROUGH 1971 WITH EMPHASIS ON ECONOMIC IMPACT IN FRANKLIN COUNTY

Whitfield, William K., Jr.
Special Scientific Report No. 38, Marine Research Laboratory, Florida Dept. of Natural Resources, St. Petersburg, Fla. (Apr. 1973), 42 pp. Price not given.

Increased demand for oysters has led to overexploitation and depletion of many natural oysters beds, and there has been a substantial decline in oyster production. Workers in the oyster industry have turned toward rehabilitation of natural oyster bars and the building of new ones to increase production. A project supported by the Federal and State governments was undertaken to construct and rehabilitate oyster reefs in Florida. Areas suitable for reef construction were selected on the basis of water quality, hydrography, physiography, and biological considerations. Over 4.2 million bushels of oyster shell and other cultch materials have been planted in 10 counties since 1949. Planting costs were 9.5 cents per bushel, and the unamortized planting expenditures were less than 1% of the estimated value of the oysters expected to be produced from these reefs over a 20-year period. The cultch was planted by blowing shell off the sides of a stationary barge with high-pressure water streams. Oysters of legal size were observed 6 months after planting the cultch material. The final retail value of oysters produced in Franklin County accounted for about 48% of the total personal income there. About 46% of the people employed in the county worked in the oyster industry.
[36 figures, 6 tables, 22 references] SW

9.16 DOES THE ADDITION OF TRIAZINE TO FISH PONDS CHANGE THE WATER QUALITY?

Johannes, H., and D. Luedemann (Ciba-Geigy A.-G., Frankfurt/M., Germany)
Chemical Abstracts 78, No. 24, 151495b (June 18, 1973)

9.16 RETENTION OF HERBICIDES IN WATER, SLUDGE, AND FISH AFTER APPLICATION IN FISH PONDS

Maier-Bode, H. (Pharmakol. Inst., Rheinisch Friedrisch Wilhelms-Univ., Bonn, Germany)
Chemical Abstracts 79, No. 2, 9528s (July 16, 1973)

9.17 AN INVESTIGATION OF PROPAGATION AND THE MINERAL NUTRITION OF SPARTINA ALTERNIFLORA

Broome, Stephen W. (Dept. of Soil Science, North Carolina State University, Raleigh, NC 27607), William W. Woodhouse, and Ernest D. Seneca
Sea Grant Publication UNC-SG-73-14, North Carolina State University, Raleigh, NC 27607 (July 1973), 122 pp.

S. alterniflora is the dominant plant of the intertidal zone of bays and estuaries of the east coast of the United States; it produces a large amount of the food energy utilized by certain fauna and it helps the transfer of mineral nutrients from the sediments to surrounding waters. It is also useful in retarding erosion of shorelines and in trapping sediments and increasing the elevation. Thus, S. alterniflora salt marshes are a valuable natural resource; nevertheless, many acres of the plant have been destroyed by man's activities. Therefore, creating new salt marshes by cultivating S. alterniflora would be desirable. This publication is a report of a study of the effect of source of seed and storage treatments on viability of seed of S. alterniflora and the performance of seed planted in suitable habitats in North Carolina estuaries.

Results of the study suggest that seed should be collected from vigorous stands of the plant and stored over winter submerged in estuarine or sea water at temperatures between 2°-3° C.

Application of fertilizer increased the growth of S. alterniflora. The standing crop of above-ground shoots growing on sand was increased by addition of nitrogen alone and increased threefold when phosphorus was also supplied. Nitrogen

9.17 PROCEEDINGS 2ND ANNUAL TECHNICAL CONFERENCE ON ESTUARIES OF THE PACIFIC NORTHWEST

Engineering Experiment Station Circular No. 44, Oregon State University, Corvallis, Oreg. (1972), 111 pp. Price $4.00

The purpose of this conference, held Mar. 16-17, 1972, was to help increase the understanding, intelligent planning, and management of our estuarine environment. These proceedings consist of 13 papers relevant to the estuaries of the Pacific Northwest. The papers deal with the social responsibility for the management of estuaries, physical properties of estuaries, description of the estuarine ecosystems, laws and regulations, and coastal zone management. FTP

9.17 (9.6) MARINE ECOLOGY: A COMPREHENSIVE INTEGRATED TREATISE ON LIFE IN OCEANS AND COASTAL WATERS. VOLUME I: ENVIRONMENTAL FACTORS. PART 2

Kinne, Otto (editor)
Published by Wiley-Interscience, London (1971), ix + pp. 683-1244. Price $32.00.
Malcolm S. Gordon (Dept. of Biology and Institute of Evolutionary and Environmental Biology, University of California, Los Angeles, CA 90024) (reviewer)
Transactions of the American Fisheries Society 102, No. 2, 503-504 (Apr. 1973)

Part 2 contains three chapters on salinity, water movement, and turbidity. The chapter on salinity comprises 71% of the book subdivided as follows: general introduction, bacteria and other microorganisms, plants, invertebrates, fishes, and bibliography. The reviewer suggests that the chapters on water movement and turbidity are interesting but limited in value. The chapter on salinity was reviewed with mixed reactions. In the section on bacteria, fungi, and blue-green algae, the effects of human activities, such as pollution, on these organisms are not mentioned. The plant section deals mainly with algae but ignores mangroves. Information on marine plants in the tropics is sparse. The section on invertebrates is based on earlier reviews by the editor and is generally satisfactory and useful. SW

9.17 (1.3)(1.25) (1.26) 1972 ADDENDUM TO COLUMBIA RIVER FISH RUNS AND COMMERCIAL FISHERIES, 1938-70

Gunsolus, Robert T. (Fish Commission of Oregon), and Henry Wendler (Washington Dept. of Fisheries) (editors)
Joint Investigational Report Fish Commission of Oregon and Washington Dept. of Fisheries Volume 1, No. 3, 44 pp. (Jan. 1973)

This report and previous reports summarize information regarding fish runs and commercial fisheries of the Columbia River since 1938. Landings of salmon and steelhead are given by season. Other species are reported on an annual basis. Since 1940 the number of salmonids entering the Columbia River have declined; however, some populations have been unchanged or increased. Over 1.6 million salmon and steelhead returned to the river in 1972. About 579,000 were taken commercially; of this number, 142,200 fish were caught by the Indian fishery. The commercial catch was mainly fall chinook and coho salmon. The fall chinook run was small compared to fall runs of the last decade. The spring chinook run was the largest on record. The summer steelhead run was the third largest since 1955. The sockeye summer run was average. Small runs of summer chinook and chum occurred again.

The shad season was limited to June 26 and June 29-July 7 below Bonneville Dam. About 122,800 lb of shad were landed during the season. Shad landed in other seasons increased the total to 225,700 lb. A substantial population of shad spawns below the dam. Smelt landings were the best since 1959. The total was 1.6 million lb; about 303,500 lb were caught in the Columbia River. The Cowlitz

9.17 (9.12) COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY, MISSISSIPPI

Christmas, J. Y. (Gulf Coast Research Laboratory, Ocean Springs, Miss.) (editor)
Published by State of Mississippi Gulf Coast Research Laboratory, Ocean Springs, Miss. (1973), 434 pp.

This study of the Mississippi State Gulf coast is divided into four phases: "Area Description," "Hydrology," "Sedimentology," and "Biology." Information for the phase on biology was obtained by standard sampling procedures in which plankton and other organisms taken by seine and trawl were collected. In the plankton samples, ctenophores (comb jellies and sea walnuts) and copepods (small crustaceans) comprised the greatest number of species found. Vertebrate and invertebrate species that were collected varied in distribution by season and area relative to physico-chemical conditions. The report includes the occurrence, abundance, distribution, distribution influenced by temperature and salinity, spawning, and growth rate of fishes collected in samples taken from the estuarine study area. Of the 251 species observed in this area, the bay anchovy, manhaden, Atlantic croaker, spot, butterfish, and sand sea trout made up 93% of the fishes collected. There were other vertebrates in the samples taken. The bay anchovy was not fished by commercial fishermen. The other five most abundant species taken in the samples of the area contributed about 93% of the total commercial finfish landings in Mississippi. There are many tables in the report listing the names and abundance of zooplankton, fish, shrimp, mollusks, reptiles, birds, and mammals. There is a large section describing the marshes of the area and the flora they contain. The threat of dredge and fill operations is also discussed. SW

9.17 (1.3)(1.25)(1.26)

River run had a catch of 1.3 million lb taken in January and early March. The 1972 smelt run was above average. Sturgeon are taken during all commercial fishing seasons. About 305,700 lb of white sturgeon were landed which is comparable to the 1971 catch of 311,500 lb. Green sturgeon landings of 44,800 lb were below the 10-year average.

There are 30 tables in this report which summarize the statistics of the fish runs and the commercial fishery in 1972. SW

9.17 (9.6) NATURAL ECOSYSTEMS

Clapham, W. B., Jr. (Case-Western Reserve University, Cleveland, Ohio)
Macmillan Co., New York (1973), 248 pp. Price $3.95, paperback.

This book begins with an overview of the basic components of an ecosystem and their significant characteristics. An outline of the interactions between components of the ecosystem are presented in relation to the cycle of the energy (heat, light, tides) and resources that maintains them. Population and community dynamics are described. Aspects of the environment are related to aquatic and terrestrial ecosystems. The adaptability of an ecosystem to changes in its environment, either natural or manmade, tests its fitness to survive. In covering this subject, the author discusses the future of ecosystems in response to a perturbation such as climate change. SW

9.17

fertilizer doubled the standing crop of short S. alterniflora growing on finer textured sediment, but there was no response to phosphorus. No growth response was obtained from application of iron fertilizer.

Because nitrogen and phosphorus are limiting in the growth of S. alterniflora in some salt marshes, it is possible that the marsh may act as a buffer for the estuarine system providing a sink for excess nutrients which may come from municipal wastes and land runoff. Excess nutrients in the marsh would produce increased growth of S. alterniflora; the plant would then provide an increased supply of food energy and nutrients to the detritus food chain of the estuary. The ability of the salt marsh to utilize nitrogen and phosphorus may be helpful in managing estuarine systems, because the disposal of wastes high in nutrients (such as sewage effluent) may be less disruptive to the estuarine ecosystem if dumped in the salt marsh rather than in the open water. However, information is yet needed on the exact nature of the nutrient cycle in the marsh-estuarine system and the capacity of the marsh to receive excess nutrients.
[15 figures, 24 tables, 46 references, appendix with 26 tables] FTP

9.17 (9.6) MARINE ECOLOGY: A COMPREHENSIVE INTEGRATED TREATISE ON LIFE IN OCEANS AND COASTAL WATERS. VOLUME I: ENVIRONMENTAL FACTORS. PART 3

Kinne, Otto (editor)
Published by Wiley-Interscience, London, New York, Sydney, Toronto (1972), xiii + pp. 1246-1774. Price $34.00.
John Teal (reviewer) (Woods Hole, Oceanographic Institution, Woods Hole, MA 02543)
Transactions of the American Fisheries Society 102, No. 2, 504-505 (Apr. 1973)

Part 3 containing contributions by 17 authors covers the following subjects: substratum, pressure, dissolved gases, organic substances, ionizing radiation, and factor combinations in the sea. The reviewer believes that the value of the book is that of a quick reference for an overall review of the field of marine ecology. SW

9.17
(1.6) HUMAN BEHAVIOR ASPECTS OF FISH AND WILDLIFE CONSERVATION

Potter, Dale R., Kathryn M. Sharpe, and John C. Hendee (compilers)
U.S. Dept. of Agriculture, Forest Service General Technical Report PNW-4 (1973), 288 pp. Price not given. Pacific Northwest Forest and Range Experiment Station, U.S. Forest Service, Portland, Oregon.

This annotated bibliography was compiled to aid students, teachers, researchers, conservationists, and managers seeking literature on nonbiological or human behavior aspects of fish and wildlife conservation. The articles are listed with abstracts. The sources of most of the articles are scientific, trade, and conservation journals; outdoor magazines; conference proceedings; state conservation department periodicals; and federal-state-university-foundation sponsored reports. An author index is included. SW

9.19 METALS -- FROM PRIVATION TO POLLUTION

Ulmer, David D. (Harvard Medical School, Boston, MA 02115)
Federation Proceedings 32, No. 7, 1758-1762 (July 1973)

This report was presented at the 56th Annual Meeting of the Federation of American Societies for Experimental Biology, in the American Society of Biological Chemists Symposium on "Man and His Environment," held at Atlantic City, N.J., Apr. 10, 1972. The author suggests that the hazards of metal pollution should be placed in proper context with the following considerations: (1) metals occur in nature but their distribution has been altered by man, (2) limitations of analytical chemistry currently hinder accurate estimates of some metals in the environment, (3) many metals have normal biological functions in contrast to the effects of their excess in living systems, (4) description of normal biological function of metals is required for evaluation of manifestations of deficiency, intoxication, or imbalance, and (5) known risks must be distinguished from erroneous speculations on metal hazards.

Metals are found normally in the earth, water, and air in concentrations that vary widely in different areas. The current concern is the redistribution of metals in the industrial society such as the increased concentrations of mercury in water and air from chemical waste and coal burning.

Current analytical techniques are inadequate for the determination of some metals in biological systems. Determining the low "natural" concentration of mercury or lead in blood is still difficult, the author suggests.

Metals differ from other pollutants in that they have essential biological functions, and they also can be toxic if ingested excessively. Often the biological

9.19 MERCURY CONCENTRATIONS IN DATED VARVED MARINE SEDIMENTS COLLECTED OFF SOUTHERN CALIFORNIA

Young, David R., and Joseph N. Johnson (Southern California Coastal Water Research Project, El Segundo, Calif.), Andrew Soutar, and John D. Isaacs (Scripps Institution of Oceanography, La Jolla, Calif.)
Nature 244, No. 5414, 273-275 (Aug. 3, 1973)

The purpose of this work was to obtain data on historic levels of mercury in the marine environment distant from specific inputs (such as waste water outfalls). Data are reported on mercury concentrations in dated varved sediment layers from the Santa Barbara Basin covering the past 150 years and in two layers estimated to have been deposited about 1,500 years BP. The basin is about 100 miles northwest of Los Angeles, and it appears to be sufficiently removed from populated areas to be free of concentrated effects of localized pollutant inputs. Core sampling techniques were used to obtain samples representative of different time scales. The samples were analyzed by neutron activation analysis and by flameless atomic absorption spectrometry.

The levels of mercury in the varved sediments of the basin showed a distinct increase toward the surface. The baseline value for the 19th century was about 0.06±0.01 mg mercury per dry kilogram of sediment, with the levels beginning to exceed this significantly some time around the turn of the century. There seemed to be a somewhat lower baseline for the older sediments. The average level for the layers deposited after 1950 exceeded the estimated 19th century baseline value by a factor of about two. A review of other published data seems to indicate that during the past 100 to 150 years human activities have resulted in a rather similar

9.19 THE EFFECTS OF PESTICIDES ON WILDLIFE EXPOSURE AND RESIDUES

Moriarty, F. (Monks Wood Experimental Station, Abbots Ripton, Huntingdon, Great Britain)
Science of the Total Environment 1, No. 3, 267-288 (Nov. 1972)

Errors in the analysis of a wildlife sample for organochlorine insecticides are relatively small; single determinations should be correct within a factor of two, unless there is a bias. Variation in level of pesticides in animals is large, there is a skew distribution, and there is a risk of biased selection for samples.

The amounts of pesticides in wildlife are measured for two primary reasons: to decide whether the wildlife species are endangered by the pesticide and to survey the environment for possible pollution by the pesticide.

The relationship between exposure and amounts in animals, consistent with a mammillary model, can be made from the following deductions: (1) the concentration of the pesticide in a tissue depends upon the rate of intake in the food, (2) the level of a pesticide in a tissue approaches an upper limit if there is a constant rate of intake, (3) the concentrations of pesticide in different tissues are correlated, and (4) when exposure to the pesticide ends, the level in the tissues decreases. If exposure to the pesticide is intermittent, the amount in the animal will depend upon the time since its last exposure. If stable plateaus are not maintained, the level of the pesticide in animals may decline with time regardless of whether the amount of exposure to the pesticide is increasing, stationary, or decreasing. Transition from sublethal to lethal levels can occur

9.19

pattern of increased mercury introduction to several reservoirs in the northern hemisphere. The anthropogenic input rate of mercury to the southern California coastal marine reservoir seems to have matched the natural input rate in recent years.

An alternative explanation offered by the authors is that mercury is relatively mobile in the interior of anaerobic sediments and that it is continuously being concentrated in the newly deposited and less anaerobic sediment of the surface layer. The chemistry and mobility of mercury in these marine sediments are yet too poorly understood to exclude this possibility. It seems, therefore, that man recently has increased, on a regional scale, the level of mercury in the southern California marine ecosystem by a factor of about 2.
[1 figure, 11 references] FTP

9.19 COMPOSITION OF WASTE WATERS OF FISH-PROCESSING INDUSTRIES.

Pesenson, I. B., E. V. Porkhal, A. P. Baranova, and A. N. Zabbarov (U.S.S.R.)
Chemical Abstracts 78, No. 22, 140156r (June 4, 1973)

9.19

rapidly (because fat reserves may be mobilized) when the level of the pesticide in the tissues changes abruptly.

The author states that it is unlikely that predators accumulate the insecticide contained in their prey. Aquatic predators acquire their insecticide directly from the water, not from their food. In terrestrial food chains, like should be compared with like; if terrestrial predators have higher levels of pesticide than their prey, it probably indicates a difference in metabolic and excretory rates or selection by the predator of the more contaminated individuals from their prey species.

Pesticide residues in an animal show that it has been exposed to that pesticide; however, much more information is needed before quantitative deductions can be made from such data about levels of the pesticide in the environment.
[5 figures, 5 tables, 93 references] FTP

9.17 THE ECONOMICS OF OVEREXPLOITATION
(9.2)(9.3)

Clark, Colin W. (University of British Columbia, Vancouver 8, British Columbia, Canada)
Science 181, No. 4100, 630-634 (Aug. 17, 1973)

Renewable resources possess self-regeneration capacities which can either be conserved for continual use or destroyed by over use. Environmental pollution often is a result of overexploitation of the regenerative capacity of the atmospheric and water resources. Economists believe that the leading economic cause of pollution is that it is not normally accounted for in the cost-revenue analysis of producers. Biological resources are also subject to overexploitation. This has been observed in the accelerating decline of many important fisheries in recent years. The need for effective international regulation of fisheries is pressing. The economic analysis of a biological resource such as the blue whale suggests that overexploitation (reduced productivity) may result from two social conditions: common property competitive exploitation and private property maximization of profits. For whales, which are economically valuable but possess low reproductive capacity, either condition could lead to extinction of the population. The author described a simple mathematical model to prove his points that a corporate owner of property rights in a biological resource might prefer extermination to conservation on the basis of maximization of profits and that this is a definite possibility under private management of such renewable resources.
[6 figures, 24 references] SW

9.19

interest in a metal begins with its toxicity; later, the essential biological function of the metal is discerned. The author suggests that the problem of pollution is not to establish whether or not a metal has toxic properties, but rather at what concentrations it shows responses of deficiency, essential functions, imbalance, pharmacological action, or toxicity.

Presently available data does not permit an accurate assessment of the ecological threat posed by metals in the environment. To acquire these data the author suggests: a systematic study of long-term trends in the redistribution of metals in the environment and their rate of buildup, expansion of investigations of the effects of metals on biological systems, and development of more sensitive signals of toxicity. In support of these efforts, more rapid, sensitive, and accurate analytical methods for metal determinations must be developed.
[1 figure, 7 tables, 11 references] SW

9.19 SAFETY QUOTIENT AS A CRITERION FOR JUDGING THE TOXICITY OF HERBICIDES TO FISH

Neururer, H. (Bundesanst. Pflanzenschutz, Vienna, Austria)
Chemical Abstracts 78, No. 23, 144120x (June 11, 1973)

9.19 (1.951)(1.0146) MERCURY AND OTHER METALS IN BRITISH SEALS

Heppleston, P. B. (Seals Research Division, Institute for Marine Environmental Research, c/o Fisheries Laboratory, Lowestoft, Suffolk, England), and M. C. French
Nature 243, No. 5405, 302-304 (June 1, 1973)

Concern about pollution has caused investigations to be conducted into the distribution of heavy metals in the environment and in living forms. To add to the information about take up of heavy metals in seals, the authors have analyzed the tissues of 96 seals inhabiting 6 sites around Britain and present preliminary results in this article. The seals were either the common seal Phoca vitulina or the gray seal Halichoerus grypus.

The results indicate that there were regional variations in mercury concentrations in the brain; the brains of seals from the Outer Hebrides and Farne Islands had higher concentrations of mercury than the brains from seals taken from the other sites. In addition, concentrations of mercury in the brain did not increase with the age of the seals. However, the concentrations of mercury in the liver correlated positively with the age of the seals. Cadmium was found in relatively large quantities (22 p.p.m. wet weight) in all kidneys; the concentrations tending to increase with age. Brains and livers contained less than 1 p.p.m. of cadmium. Lead, zinc, and chromium were found in molar teeth, with cadmium and copper in lesser quantities. There was a progressive decrease in concentrations of lead, cadmium, and chromium in teeth in relation to age; young seals had higher

9.19 INSECTICIDES, POLYCHLORINATED BIPHENYLS AND MERCURY IN WILD CORMORANTS, PELICANS, THEIR EGGS, FOOD AND ENVIRONMENT

Greichus, Yvonne, A. Greichus, and J. R. Emerick (South Dakota State University, Brookings, SD 57006)
Bulletin of Environmental Contamination and Toxicology 9, No. 6, 321-328 (June 1973)

Earlier reports indicated that organochlorine insecticides, polychlorinated biphenyls (PCBs), and mercury which are present in the environment also are present in the food chain of fish and accumulate in the tissues of fish-eating birds. The authors determined the levels of these pollutants in the sediments and water of two lakes in South Dakota and in the birds and fish of the lakes to find out whether biological concentration had occurred.

The concentration of organochlorine insecticides in the bottom sediments was found to be 7-fold greater than in the water; the concentration of these insecticides in fish was found to be 10-fold to 60-fold greater than in the bottom sediments. The concentration of PCBs in fish were found to be 12-fold greater than in bottom sediments, and the levels of PCBs in the fish and in the bottom sediments were higher than those of the insecticides. Mercury was not found in water, bottom sediments, or fish except carp which had the highest levels of insecticides and PCBs.

Other results indicate that adult cormorants and pelicans had, respectively, 250-fold and 280-fold greater levels of insecticides than fish. The concentration of PCBs in the bodies of cormorants and pelicans were, respectively, 60-fold and 30-fold greater than in fish. Insecticide and PCB levels in cormorant eggs corresponded to the body levels that were found in the adult birds and were higher than

9.19 WATER QUALITY CRITERIA FOR EUROPEAN FRESHWATER FISH. REPORT ON AMMONIA AND INLAND FISHERIES

Prepared by the European Inland Fisheries Advisory Commission Working Party on Water Quality Criteria for European Freshwater Fish
Water Research 7, No. 7, 1011-1022 (July 1973)

The effect of ammonia is an important factor in establishing water quality criteria for European freshwater fish. Common sources of ammonia in water are sewage effluent and effluents from certain industries and from agriculture. The toxicity of ammonia to fish is related to the pH value and the temperature of the water, which factors govern the concentration of un-ionized ammonia present--only the un-ionized fraction of ammonia is poisonous. The level of the un-ionized fraction increases with rising pH and rising temperature.

Depending upon the species, fish differ only slightly in their tolerance to ammonia; this difference is more significant for short periods of exposure. Nevertheless, the difference in tolerance is not large enough to justify different quality criteria for different species of freshwater fish.

The lowest toxic level of ammonia (un-ionized) for salmonids is 0.2 mg NH_3 per 1^{-1}; however, other adverse effects resulting from prolonged exposure are only absent at levels less than 0.025 mg NH_3 (un-ionized) per 1^{-1}. Concentrations of total ammonia in the water that contain 0.025 mg $NH_3/1^{-1}$ (un-ionized) vary from 19.6 mg/1^{-1} (pH 7.0, 5° C) to 0.12 mg/1^{-1} (pH 8.5, 30° C). The report states that the criterion should not be applied to temperatures below 5° C or to pH values above 8.5 when other factors have to be taken into consideration.

[2 figures, 2 tables, 51 references] FTP

9.19 GENETIC RESISTANCE TO DDT IN THE JAPANESE QUAIL COTURNIX COTURNIX JAPONICA

Poonacha, K. B., B. C. Wentworth, and A. B. Chapman (Depts. of Poultry Science and Genetics, University of Wisconsin, Madison, WI 53706)
Poultry Science 52, No. 3, 841-846 (May 1973)

The purpose of this study was to find out whether the Japanese quail could develop a resistance to DDT. The experiments were designed so that the effects of environmental stress on the resistance of birds selected for resistance to DDT could also be determined. These selection studies of resistance to DDT involved eight generations of Japanese quail--two selected lines and one control line. One selected line of quails differed from the other selected line in that, besides mass selection, the birds were chosen on the basis of family merit. The selected lines of quail were fed 200 p/m of DDT during their first 30 days of life. Part of the control lines were also fed DDT (to test for resistance), and the mortality of the control group was compared to the mortality of the selected lines.

The Japanese quail started to develop resistance to DDT after the third generation of selection. When the DDT-fed resistant lines and the control group of quail were exposed to partial starvation and cooler temperatures, the selected lines had lower mortality than the control line fed DDT. Among the resistant lines of quail, the females were less resistant than the males. The DDT resistant lines also showed some cross-resistance to lindane (another hydrochlorinated pesticide). The authors conclude that a DDT-resistant strain of Japanese quail can be developed out of the less resistant population by selection.

[1 figure, 4 tables, 28 references] FTP

9.19 (9.6) [THE SERIOUS THREAT TO THE MARINE ENVIRONMENT]
HAVSMILJÖN ALLVARLIGT HOTAD

Dybern, B. I. (Inst. Mar. Res., S-453 00 Lysekil, Sweden)
Medd. Havsfiskelab., Lysekil, Sweden (1972), 122 pp.
Aquatic Sciences & Fisheries Abstracts 3, No. 2, 182-183, Abstract No. 3Q1844M (Feb. 1973)

A pollutant is a substance which is discharged into the sea by man and is harmful to the ecosystem. The result may be reduced production of seafood, the contamination of seafood, and interference with commercial fishing and recreational use of the sea. Many thousands of pollutants have been discharged into particularly sensitive areas of the sea such as the light penetrated surface zone where primary production of organisms takes place. The pollutants are discharged into the sea by rivers, via the air, and from dumping by ships. The sea disperses the pollutants by diffusion, turbulence, and currents. Organic nutrient substances containing phosphorus and nitrogen contribute to eutrophy and may take oxygen from the sea. Bacteria and viruses accompany an unhygienic condition. Industrial compounds and pesticides add toxic qualities to the sea. Persistent compounds accumulate and remain to poison generations of organisms. More research is required to determine how much the environment and ecosystems can tolerate. Legislation based on facts developed by the research should be enacted to control pollution. International cooperation should be instituted for global pollution problems. SW

9.19 (1.92) WINTER-SPRING SPORT FISHERY IN THE HEATED DISCHARGE OF A NUCLEAR POWER PLANT

Marcy, B. C., Jr., and R. C. Galvin (Essex Marine Laboratory, Essex, CT 06426)
Journal of Fish Biology 5, No. 4, 541-547 (July 1973)

A substantial winter-spring sport fishery has developed in the heated discharge canal of the Connecticut Yankee Atomic Power Company on the Connecticut River. Fishermen using the canal in the cooler months were able to catch twice as many fish per unit effort as those fishing the Haddam area from April to November. These anglers caught 10 times more fish than fishermen 141 km upstream. A correlation was found between the water temperature of the canal and the number of fish caught per rod-hour of effort. But the catch rate declined markedly when the plant's power level dropped enough to lower the canal temperature appreciably. On these occasions, some fish acted as if they were stunned while being carried out of the canal by the current. No mortality of fish was observed. The authors concluded that anglers fishing in the canal expended only half the effort to catch the same amount of fish as those fishing at other places in the vicinity of the canal. [1 figure, 2 tables, 9 references] SW

9.19 (1.951)(1.0146)

concentrations than older ones. Zinc levels showed reverse results; these levels increased with age. Regional comparisons of metals in seal teeth showed no clear pattern except for cadmium and lead; these metals decreased in seals taken from the sites in the following order: Orkney and Shetland Islands, East Anglia, the Outer and Inner Hebrides Islands, and the Farne Islands.

The authors suggest that taking age into account is important in studying the concentrations of metals in tissues; conclusions based upon small samples can be misleading if the age of the animal (from which the samples were taken) is unknown. [2 figures, 4 tables, 11 references] SW

9.19

those in pelican eggs. Cormorant eggs also had higher levels of mercury than pelican eggs. More insecticides and PCBs were concentrated in the fat of cormorants and pelicans than in any other tissue. The predominant residue was found to be DDT. [4 tables, 27 references] SW

9.19 THE ACUTE TOXICITY OF A YELLOW PHOSPHORUS CONTAMINATED DIET TO BROOK TROUT (SALVELINUS FONTINALIS)

Fletcher, G. L. (Fisheries Research Board of Canada, Halifax Laboratory, Halifax, Nova Scotia, Canada)
Bulletin of Environmental Contamination and Toxicology 10, No. 2, 123-128 (Aug. 1973)

Contaminated cod muscle (containing 4-11 µg of yellow phosphorus per gram of muscle) and cod liver (containing 194 µg of yellow phosphorus per gram) were lethal when fed to brook trout. The toxic dosage of P_4 ranged from about 1.23 to 2.73 µg. This study further indicates that yellow phosphorus can exert its lethal effects internally.
[2 tables, 9 references] FTP

9.19 ACCUMULATION OF CESIUM-137 IN FINNISH LAPPS

Rahola, Tua, and Jorma K. Miettinen (Dep. Radiochem., Univ. Helsinki, Helsinki, Finland)
Chemical Abstracts 78, No. 23, 144802w (June 11, 1973)

9.19 ENVIRONMENTAL IMPACT: CONTROLLING THE OVERALL LEVEL

Westman, Walter E. (University of Queensland, Brisbane, Queensland, Australia 4067), and Roger M. Gifford
Science 181, No. 4102, 819-825 (Aug. 31, 1973)

The interactions of three elements are suggested as influencing the rise of current environmental problems. They are (1) the size of the human population and its rate of growth, (2) increasing consumption of goods, and (3) resource wasting and pollution generating technologies. Other reports indicate that unchecked growth of these three factors is inimical to the continuation of civilization. In dynamic systems, it appears that negative feedback is necessary to achieve a long-term steady state. If natural environmental feedback were to arrive in full force, such as that predicted by Malthus, there would be much hardship. To avert such hardships, the authors describe a mechanism that acts as a rapid, anticipatory feedback system and also limits the impact that society makes on the environment. The system has three features that would control environmental impact: (1) it could be used to set the rate of environmental decay within a wide range, (2) restrict activities that have severe, irreversible, adverse effects on the environment, and (3) set some restriction on personal freedom.

The basis of the system is the natural resource unit (NRU). Every resource use and activity (including childbirth) that causes environmental impact is assigned a price in money-independent NRU's. NRU's would be allocated equally to all individuals and to other organizations including government agencies. The government would fix the annual allocation and price of NRU's for each good, service, and activity, based on the overall level of environmental impact gathered from existing

9.19 ORAL TOXICITY OF CHLORINATED DIBENZOFURANS TO JUVENILE ATLANTIC SALMON

Zitko, V. (Fisheries Research Board of Canada, Biological Station, St. Andrews, New Brunswick, Canada), and P. M. K. Choi
Bulletin of Environmental Contamination and Toxicology 10, No. 2, 120-122 (Aug. 1973)

The levels of chlorinated dibenzofurans in the tissues of juvenile salmon (Salmo salar) were determined; the chemicals were administered to the fish by incorporating them in the dry fish food. The dry fish food was spiked with di-, tri-, tetra-, and octachlorodibenzofuran at calculated and (determined) levels of 2.7 (2.1), 5.7 (4.4), 2.8 (2.2), and 9.1 (9.7) µg/g, respectively. The fish were kept in 20-liter tanks and were fed the food several times a day.

The median mortality (LT50) was 120±30 days for the fish on the diet containing the chlorinated dibenzofurans. Apparently the chlorinated dibenzofurans are more toxic than PCB. Di-, tri-, and tetrachlorodibenzofuran were not detected in any of the samples of muscle or gut of the dead or live fishes. Because of the high toxicity and low residual levels of chlorinated dibenzofurans, a more sensitive method of analysis is needed. Also, considerable more work is required on the mechanism and kinetics of the formation of these compounds and on their toxicity.
[1 table, 5 references] FTP

9.19 PRELIMINARY SURVEY OF MERCURY AND OTHER METALS CONTAINED IN ANIMALS FROM THE FRASER RIVER MUDFLATS

Parsons, T. R., C. A. Bawden, and W. A. Heath (Institute of Oceanography, University of British Columbia, Vancouver, British Columbia, Canada)
Journal of the Fisheries Research Board of Canada 30, No. 7, 1014-1016 (July 1973)

The content of mercury and other heavy metals was determined in crabs and other marine animals taken from the Sturgeon Bank and Roberts Bank of the Fraser River mudflats. For comparative purposes, samples of marine organisms taken from two other areas, the Cowichan Bay mudflats and Kitimat Arm, were also analyzed. The highest levels of mercury and heavy metals were found in samples of marine animals from Sturgeon Bank; these data indicate that the Fraser River was probably not the source of the pollutants. The city sewer outfall empties onto Sturgeon Bank which may account for the source of the heavy metal contamination. The mercury content of the meat of crabs taken from the mudflats is shown in the table that follows.
[1 table, 2 references] FTP

9.19 TREATMENT OF EEFLUENT FROM MANUFACTURE OF CHLORINATED PESTICIDES WITH A SYNTHETIC, POLYMERIC ADSORBENT, AMBERLITE XAD-4

Kennedy, David G. (Research Div., Rohm and Haas Co., Philadelphia, PA 19137)
Environmental Science and Technology 7, No. 2, 138-141 (Feb. 1973)

Amberlite XAD-4 is a crosslinked polystyrene copolymer in the form of 20-50 mesh beads; the bead porosity is 51 volume percent; the surface of the bead area is about 750 m^2/g; and the average pore diameter is 50 Å. The properties of this material make it applicable to treating waste effluents containing chlorinated pesticides. In addition, the hydrophobic properties of XAD-4 enable it to adsorb hydrophobic pesticides from aqueous systems. The pesticides were reported to be adsorbed even from very dilute solutions. Leakage of pesticides from a column containing the material was less than 0.25 p/m. The XAD-4 can be regenerated by subjecting it to treatment with solvents such as methanol or isopropanol. In comparison with an activated granular carbon column, the XAD-4 column leaked less pesticide, and the activated carbon could not be regenerated with isopropanol. In comparisons of operating expenses, pesticide waste treatment with XAD-4 would be more economical than with activated carbon because the former can be chemically regenerated and the solvent can be reused. The adsorbed pesticides can be recovered from the solvent and recycled, to lower operating expenses.
[3 figures, 5 tables, 4 references] SW

9.19

Size of crab (width of carapace)	Mercury content of the meat of crabs from areas: Fraser River Mudflats			
	Sturgeon Bank	Roberts Bank	Cowichan Bay	Kitimat Arm
mm	p/m	p/m	p/m	p/m
95	0.48			
98	0.43			
99	0.37			
108	0.43			
121				0.14
122		0.21		
125		0.18		
138		0.34		
142				0.42
144				0.49
145			0.12	
146		0.32		
147	3.7			
148	2.2			
151	3.0		0.44	
152	1.9 & 1.5			
155		0.90		
156				0.26
159	3.4			
160			0.13	
161	1.5 & 2.0			
165			0.25 & 0.15	
170				0.50

9.19

data and social priorities. The NRU system would complement the existing money based system. The NRU system would set a national "fiscal" policy to control the rate of consumption of resources and the rate of pollution released; thus, the government would continuously control the level of environmental impact by a form of rationing. The NRU differs from money in that it is nontransferable. The NRU system differs from laissez-faire capitalism in the governmental adjustment of NRU prices and regulation of the supply of the NRU's. The NRU system differs from a mixed economy (Western capitalism) in governmental regulation of resource utilization, and it differs from a command economy (U.S.S.R.) in an emphasis on consumer choice in the allocation of resources among the population.

Among the developing nations of the world, the concept of limiting activities that adversely affect the environment would be rejected because it would lock them into their underprivileged status. The authors suggest that the NRU system is not acceptable to the public at this time; however, as levels of pollution increase, pressure will mount for action to limit population growth and other activities that have environmental impact.

[50 references] SW

9.19 EPIDEMIOLOGY OF DDT
(9 6)

Davies, John E., and Walter F. Edmundson (editors)
Futura Publishing Co., Inc., New York, N.Y. (1972), x + 157 pp. Price $14.95.
F. P. W. Winteringham (Joint FAO/IAEA, Vienna, Austria) (reviewer)
Pesticide Biochemistry and Physiology 3, No. 2, 223 (June 1973)

This monograph is a series of reports by various authors consisting of data on pesticide exposure, residues found in human tissue samples, health, social, and environmental status under conditions in Florida (U.S.A.), with particular reference to DDT, its biochemistry and pharmacology. The reviewer states that these studies suggest some interesting findings some of which are: Conspicious gaps in quantitative information remain concerning the overall fate of DDT in man; DDE in human tissue is a better indicator than is DDT of long-term exposure; and routes of DDT exposure in man other than residues in food may be significant. FTP

9.19 ADVANCES IN WATER POLLUTION RESEARCH
(9.6)
Jenkins, S. H. (editor)
Pergamon Press, New York (1973), xxvi + 946 pp. Price not given

This book consists of the proceedings of the Sixth International Conference of the International Association on Water Pollution Research held in Jerusalem, June 18-23, 1972. Topics covered include: oxygen transfer relative to thermal pollution; trace metals, microbiology and virology of waste water, groundwater, eutrophication, sewers and storm water; and sewage treatment. A major topic that is of interest to fishermen and fishfood processors is the one on industrial waste water problems (pp. 549-625). Other major topics include advanced treatment processes with reuse of waste water, and water management relative to water quality. This group includes reports on mercury analysis (p. 819) and the transitional condition of Minamata Bay, Japan, with regard to mercury pollution (p. 905). SW

9.19 EFFECT OF DDT ON TEMPERATURE SELECTION OF SOME SALMONIDS

Javaid, M. Yaqub (Dep. Biol., Carleton Univ., Ottawa, Ontario, Canada)
Chemical Abstracts 78, No. 23, 144105w (June 11, 1973)

9.19 WATER POLLUTION MANUAL 1972
(9.6)

Thunderbird Enterprises Ltd., 102 College Road, Harrow, HA1 1BQ Middlesex, England
(n.d.), over 300 pp. Price £12.80, US$40.00.

This reference book deals exclusively with effluent and water treatment. The 26 editorial sections are written by specialists in their particular field, and they present a summary of the latest available information in products, materials, and processes. FTP

9.19 (1.951) ORGANOCHLORINE RESIDUES IN HARP SEALS (PAGOPHILUS GROENLANDICUS) CAUGHT IN EASTERN CANADIAN WATERS

Frank, R. (Pesticide Residue Laboratory, Ontario Ministry of Agriculture and Food, Guelph, Ontario, Canada), K. Ronald, and H. E. Braun
Journal of the Fisheries Research Board of Canada 30, No. 8, 1053-1063 (Aug. 1973)

Samples of blubber, brain, and other tissues of wild harp seals, captured in the Gulf of St. Lawrence and off the east coasts of Newfoundland and Labrador, were analyzed for organochlorine pesticides. The level of DDT and its metabolites in the blubber of juveniles taken from the gulf was more than 2 p/m and less than 2 p/m in the blubber from seals taken in the two east coast locations. The levels increased as the animals matured and were found to level off in females tested at the breeding age. (Differences in levels of the pesticide in adult females taken from either location were not marked.)

Dieldrin did not accumulate appreciably. PCB levels were slightly less than those of DDT (and its metabolites) in the blubber and increased with the age of the seal. PCBs accumulated two to three times more in young seals taken from the gulf than in those taken from the east coasts of Newfoundland and Labrador. Among adult females from either location, the differences in PCB levels were small. In samples of brain, the levels of the three compounds were significantly less than those found in the other tissues sampled; the authors suggest the existence of a brain barrier. Levels of the three compounds in the tissues of captive seals were up to eight times higher than in wild seals. This difference indicated that either natural diets contained lower levels of the residues or there are different rates of

9.19 (8.42) MERCURY IN FISH AND SHELLFISH. A REVIEW

Holden, A. V. (Freshwater Fisheries Laboratory, Pitlochry, Scotland)
Journal of Food Technology 8, No. 1, 1-25 (Mar. 1973)

This review is a brief description of the historical events leading to the problem of mercury levels in fish, the analytical methods now available for the routine analysis of methyl mercury and total mercury in fish, the levels of mercury in various species of fish (freshwater and marine) in different areas of the world, the toxicological significance of mercury in human food, and the problem of establishing a limit of acceptability for mercury residues in food. It appears that for most marine species of fish, levels of mercury of the order of 0.1 mg/kg are normal, with higher values for the large predatory fish and much higher for the mammalian carnivore. For freshwater fish, levels up to 0.5 mg/kg may be normal for some predatory species, but there is greater variability among samples from different areas. The high levels in marine fish in excess of 1 mg/kg occur most likely in coastal areas of local discharges of mercury-containing wastes.

The present level of mercury in oceanic water is presumed to be at equilibrium (as a result of mercury discharge from the rivers and from volcanic disturbances). It is estimated that discharge of mercury to the oceans is twice that contributed by natural discharge. The present level in the oceans is probably greater than that of 50 years ago. If the total discharge of mercury from industrial establishments is decreased significantly, a slight decrease in the oceanic water equilibrium level might be expected.

9.19 MARINE STUDIES OF SAN PEDRO BAY, CALIFORNIA. PART II. BIOLOGICAL INVESTIGATIONS

Various authors and papers listed below
Dorothy F. Soule and Mikihiko Oguri (editors)
Published by the Allan Hancock Foundation and the Office of Sea Grant Programs, University of Southern California, Los Angeles, CA 90007 (June 1973), iv + 237 pp.
Card A

This bulletin presents the results of the biological studies of the role of cannery effluent on the ecosystems of adjacent Los Angeles Harbor waters. The reports are as follows:

"Introduction," by Dorothy F. Soule and Mikihiko Oguri, pp. 3-19. The results indicate that the harbor waters are highly productive at every trophic level monitored. [4 figures, 2 tables, 11 references]

"Free Amino Acid Variations in the Anchovy, Engraulis mordax from the Los Angeles Harbor," by Rita D. Schafer and Elizabeth Swann, pp. 23-27. In this study an attempt was made to determine whether or not the conditions in the Los Angeles Harbor affected the biological composition of the anchovy present in the water. Analyses were made of the free amino-acid content of the white muscle tissue of specimens of anchovy taken within the Los Angeles Harbor area; these data were compared with those from specimens taken from waters outside the harbor area. The free amino-acid content within an organism is a reflection of the protein metabolism of that organism. Data are given on the content of 33 free amino acids in the white muscle in three specimens from the harbor area and in one control sample. The results indicate that changes do occur in specimens of anchovy found in the Los Angeles Harbor area. [1 table, 2 references]

9.19 MARINE STUDIES OF SAN PEDRO BAY, CALIFORNIA. PART II. BIOLOGICAL INVESTIGATIONS

Various authors and papers listed below
Dorothy F. Soule and Mikihiko Oguri (editors)
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Card B

"The Demersal Fish Populations of San Pedro Bay," by John S. Stephens, Jr., and David Gardiner, pp. 149-166. Sixty-one trawl samplings were made of the demersal fishes of San Pedro Bay outside of Los Angeles - Long Beach Harbor. The average catch per trawl outside the harbor is less than that previously found in the harbor and seems to indicate that harbor waters may support as rich a fish fauna, if not richer, than that of adjacent areas. The various species landed and the catch rates are described. [5 figures, 3 tables, 7 references]

"Annotated Bibliography on the Northern Anchovy, Engraulis mordax Girard," by Gary D. Brewer, pp. 169-191. This bibliography contains 101 references to the published literature on the northern anchovy prior to 1973.

"Numerical Analysis of a Benthic Transect in the Vicinity of Waste Discharges in Outer Los Angeles Harbor," by Robert W. Smith, pp. 195-237. Various approaches may be used to determine the effects of waste discharges on the benthos: (1) The direct effect of the constituents of the waste on organisms can be determined directly, (2) The degree of abnormalities and of disease in the organisms in the vicinity of the waste discharges can serve as an indicator of the harmful effects of the waste materials, (3) The level of the population of certain "indicator species"

9.19 (8.42)

Restriction on the consumption of fish containing up to 1 mg/kg of mercury appears unnecessarily cautious, but heavy consumption of fish from areas where local pollution has resulted in levels well above 1 mg/kg in fish should be discouraged.

The 'practical residue limit' of mercury recommended by WHO (World Health Organization) for food generally is 0.02-0.05 mg/kg, but this limit is clearly not applicable to fish. The limit of 0.5 mg/kg would create problems with fisheries for certain species such as tuna and swordfish and possibly for lobsters and some mollusks. At a limit of 0.2 mg/kg, a wide range of species, including gadoids and flatfish and many freshwater fish, would be restricted. A maximum level of 1 mg/kg would cause little difficulty, except in some areas where freshwater fish are involved. In view of the importance of fish as a protein source in many parts of the world, the author believes that it is essential that a decision on the maximum mercury content permissible for fish for human consumption be reached as soon as possible.

[2 tables, 83 references] FTP

9.19

(organisms commonly found at certain known levels of pollution) may be used as an index of the pollutant effects. In the present study, the researchers applied a principal component analysis and a hierarchical classification method to sort out some of the biotic-abiotic relationships of the benthos in the vicinity of waste outfalls in outer Los Angeles Harbor. [7 figures, 6 tables, 54 references] FTP

9.19 LEAD-210 IN SOME HYDROBIONTS OF THE SEA OF OKHOTSK AND THE BERING SEA

Sokolova, N. V., and V. P. Parchevskii (Inst. Biol. Yuzhn. Morei, Sevastopol, U.S.S.R.)
Chemical Abstracts 78, No. 25, 156110g (June 25, 1973)

9.19 (1.951)

uptake between captive and wild seals. The authors further suggest that the differences in residue levels in young wild harp seals taken from the gulf and the levels in seals taken from the coastal regions may indicate the existence of subpopulation groups.

[8 tables, 13 references] SW

9.19

"The Roles of Microbial Activity in the Harbor Ecosystem," by Damian Marie Juge and Gail Griest, pp. 31-63. In this study (1) dye-bacterial organism diffusion tests were made to determine the circulation of water in the Los Angeles Harbor area of the cannery and domestic outfalls and (2) surface water samples were tested monthly during the period of July 1972 to March 1973 for biochemical oxygen demand (BOD), standard bacterial plate count, and coliform organisms count. It appears that the effluent from the canneries do have an enhancing effect on the bacterial population level at certain stations in the harbor area. [18 figures, 2 tables, 4 references]

"Working Report on the Dilution of Cannery Wastes Discharges Into the Los Angeles Harbor," by James E. Foxworthy, pp. 67-77. This paper reports the data obtained in the tests to determine the water circulation and physical dilution of the cannery wastes effluent in Los Angeles Harbor. Four tests were carried out in which the waste effluent was tagged with a fluorescent dye at the pumping station and was then traced and monitored as it mixed with harbor water. [1 figure, 1 table, 3 references]

"Annotated Bibliography on Cannery Effluents," by Penny A. Pinter, pp. 81-103. Ninety-two references are listed relating to the history of the fishing industry on the Pacific coast, products of the industry, processing methods, and effluent effects and treatment.

"Results of Fourteen Benthic Trawls Conducted in the Outer Los Angeles - Long Beach Harbor, California, May 24, 1972," by Dilworth W. Chamberlain, pp. 109-145. A preliminary trawl survey was made on May 24, 1972, in the Los Angeles - Long Beach Harbor to determine the species of fish available and their physical condition. The trawling yielded 3,100 fish belonging to 28 species, and representing 15 families and 7 orders. Five species (speckled sanddab, tongue sole, white croaker, shiner perch, and white seaperch) made up 85% of the total catch. The fish collected appeared in good health. [14 figures, 2 tables, 24 references]

[Continued on Card B]

9.19 MERCURY, LEAD, AND CADMIUM CONTENT IN THE HAIR OF RESIDENTS OF THE TOKYO METROPOLITAN AREA

Nishima, Taichiro, Shingo Ideda, Takahiro Tada, Hiroshi Yagyu, Mamoru Nagasaki, Ryoji Udo, and Hiroshi Kamijo (Tokyo Metrop. Res. Lab. Public Health, Tokyo, Japan)
Chemical Abstracts 78, No. 23, 144092q (June 11, 1973)

9.19 (0.35)(0.5) OXIDATION OF POLYCHLORINATED BIPHENYLS BY ACHROMOBACTER pCB

Ahmed, M., and D. D. Focht (Dept. of Soil Science and Agricultural Engineering, University of California, Riverside, Calif.)
Bulletin of Environmental Contamination and Toxicology 10, No. 2, 70-72 (Aug. 1973)

In an earlier report the authors showed that a species of Achromobacter pCB (isolated from sewage effluent) was able to degrade certain mono- and dichlorinated biphenyls. As a continuation of the earlier study, they tested the ability of this organism to degrade other isomers of polychlorinated biphenyls with 2 to 5 chlorine atoms. The following chemicals were used: 2,3-dichlorobiphenyl, 2,4-dichlorobiphenyl, 3,4-dichlorobiphenyl, 3,5-dichlorobiphenyl, 3,3'-dichlorobiphenyl, 3,4,2'-trichlorobiphenyl, 2,3,2',3'-tetrachlorobiphenyl, 2,5,3',4'-tetrachlorobiphenyl, and 2,3,4,5,6-pentachlorobiphenyl. The test procedure is described in the Canadian Journal of Microbiology (in press).

The bacterium was not able to degrade (dehalogenate) any of the chlorinated biphenyls tested.

[1 table, 2 references] FTP

9.2 WORLD FOOD SITUATION: PESSIMISM COMES BACK INTO VOGUE

Wade, Nicholas
Science 181, No. 4100, 634-638 (Aug. 17, 1973)

This review of world food developments suggests that the situation now is more serious than in 1965-67 when American grain was used to supplement poor harvests in India. All countries except India now have enough grain to cover their immediate needs, but world grain stocks are down to the lowest level in 20 years. The amount of food available for next year's needs depends on this year's harvests. The weather is a crucial factor everywhere, and successful harvests, in India particularly, require a normal monsoon season to avoid a disaster. In addition to the concern over sufficient food to avoid price disturbances, political instabilities, and famine, there are fears that a fundamental deterioration in the world food situation has occurred. Since 1943 there has been no major famine--probably the longest famine-free period in recorded history. In this period, although average diets were meager, there was a slight improvement in the amount of food consumed per person. But malnutrition persisted in the developing countries--affecting 300 to 500 million people. In addition, the overall condition of the world food situation was generally stable. In the mid-1960's the U.S. Dept. of Agriculture (USDA) forecast that, by 1984, food needed by the developing countries would eventually exceed what the United States could give away. A tract [Famine 1975!] by Paul and William Paddock, predicted that crises of food shortages will break out by 1975, 9 years earlier than the USDA prediction. "The Time of Famines" will have begun again. These pessimistic estimates of the food situation were displaced

9.2 PRACTICAL PROBLEMS OF CONSTRUCTING BIOECONOMIC MODELS FOR FISHERY MANAGEMENT

Adam, Paul (Fisheries Division, Organization for Economic Cooperation and Development)
NOAA Technical Report NMFS CIRC-371, National Marine Fisheries Service, NOAA, U.S. Dept. of Commerce, Seattle, WA 98115 (Apr. 1973), pp. 96-103.

In many practical cases it is impossible to construct a complete bioeconomic model of a given fish stock, such as when one or several fleets move irregularly from one stock to another, or when fishing effort increases so rapidly that it is not possible to accurately specify a reliable yield/effort relationship. A continuing bioeconomic model is proposed here which will allow inclusion of these dimensions while allowing both for year-to-year fluctuations in managed effort and also for gradual adjustment of labor and capital to those levels designated as optimal within the broad ranges of this continuing model. Year-to-year re-evaluation of fish stocks and capital-labor requirements is stressed.
Author's abstract
[5 figures]

9.2 AN ENVIRONMENTAL ASSESSMENT OF FUTURE PRODUCTION-RELATED TECHNOLOGICAL CHANGE: 1970-2000 (AN INPUT-OUTPUT APPROACH)

Herzog, Henry W., Jr. (Bureau of Business and Economic Research, University of Maryland, College Park, Md.)
Technological Forecasting and Social Change 5, No. 1, 75-90 (1973)

In this article, the author develops a model to systematically assess the environmental impact of specific technological changes forecast to occur over this and the following two decades.
[10 tables, 9 references] FTP

9.2 OPTIMIZATION IN COMPLEX MANAGEMENT SYSTEMS

Spivey, W. Allen (Graduate School of Business Administration, Ann Arbor, MI 48104)
Transactions of the American Fisheries Society 102, No. 2, 492-499 (Apr. 1973)

An optimization model is a model in which there is a function (of decision variables) to be optimized--either maximized or minimized. The decision variables may or may not be subject to constraints. Fisheries management and other renewable resource management problems can be solved or mitigated by means of optimization models. Linear optimization problems (in which the function to be optimized is linear and the constraints are linear) are more amenable to solution than nonlinear optimization problems.

The author provided illustrative examples showing how optimization models may be applied to water pollution control and other problems. In addition, he discussed problems in using and interpreting optimization models. The author concluded that successful model building requires effective interaction between formulation, analysis, and decision.
[3 figures, 26 references]

SW

9.2 (9.3) MULTIPLE OBJECTIVES FOR MARINE RESOURCE MANAGEMENT

Rettig, R. Bruce (Dept. of Agricultural Economics, Oregon State University, Corvallis, OR 97331)
NOAA Technical Report NMFS CIRC-371, National Marine Fisheries Service, NOAA, U.S. Dept. of Commerce, Seattle, WA 98115 (Apr. 1973), pp. 23-27.

Management decisions suggested by recent bioeconomic models have been largely disregarded by fishery managers. This negligible impact may be due to error on the part of management, an incomplete grasp of the role of noneconomic objectives, and/or the possibility that more sophisticated economic models might yield markedly different results. More sophisticated models are suggested which consider the problem of second best, risk and uncertainty, transaction and adjustment costs, and income redistribution. Creation of analytical systems amenable to treatment of noneconomic variables along with economic variables is suggested.
[7 references]

Author's abstract

9.2 SIMULATION EXPERIMENTS TO EVALUATE ALTERNATIVE HUNTING STRATEGIES FOR A DEER POPULATION

Anderson, F. M. (Dept. of Agricultural Economics, Oregon State University, Corvallis, Oreg.), G. E. Connolly, A. N. Halter, and W. M. Longhurst
NOAA Technical Report NMFS CIRC-371, National Marine Fisheries Service, NOAA, U.S. Dept. of Commerce, Seattle, WA 98115 (Apr. 1973), pp. 121-132.

A population dynamics model of the deer herd in Mendocino County, California, is presented. Environmental influences are modeled as density dependent birth and death rate functions. The computer program for this biomanagement model is outlined and validity checks devised to improve the model are discussed. The output shows the impact of selected hunting strategies on productivity, natural mortality, and other population characteristics. Tests of hunting strategies related to alternative management goals are summarized. Implications of computer simulation methodology for the management of wildlife and fish populations are discussed.
[6 figures, 1 table]

Authors' abstract

9.2

by news of the "Green Revolution." New strains of rice and wheat, from the Philippines and Mexico, produced yields many times greater than native varieties, under certain conditions. The new Mexican wheats produced bumper crops in the Punjab of India; unfortunately, wheat is not the major cereal crop of India. The new rice requires irrigated land which forms only 30% of the crop land in Asia. In addition, these new varieties required agricultural technology, such as use of high priced fertilizer, found only in the developed countries. This criticism caused the optimism generated by the Green Revolution to subside.

In 1972, the U.S.S.R. had a bad harvest; to maintain their meat herds, 30 million tons of grain were purchased on the world market. This caused grain prices to rise to historic highs and doubled shipping rates. Other countries were in the market also. Drought in the countries in the southern Sahara Desert caused a genuine famine which affected 1 to 10 million people. The Peruvian anchoveta fishery (which produced fish meal for feed) failed again in 1972 and may be permanently damaged. This caused livestock owners to use more grains for feed. Sharp increases in grain prices and reductions in wheat reserves held by the U.S. Government resulted from these events. In the short-term view, the 1973 harvest will replenish the stocks, and prices will come down. In the 1980's, the prospects for world food supplies are not cheerful: production of protein cannot be increased; increases in cereal production are forecast but are dependent on the weather; and the use of high yield strains of crops could cause social changes by reducing employment and increasing the gap between rich and poor farmers. The check on population--famine, theorized by Malthus--may now be preceded by the constraints of rural unemployment, income inequality, and social unrest.
[1 graph]

SW

9.2 SOME SUGGESTIONS FOR THE DEVELOPMENT OF A BIOECONOMIC THEORY OF THE FISHERY

Thompson, Russell G. (Quantitative Management Science, University of Houston)
NOAA Technical Report NMFS CIRC-371, National Marine Fisheries Service, NOAA, U.S. Dept. of Commerce, Seattle, WA 98115 (Apr. 1973), pp. 92-95.

In this study, the fundamental characteristics of the Schaefer model and the Thompson-George (TG) production-investment model are reviewed, and extension of the TG model are discussed. It is then indicated how a bioeconomic model for the sole ownership fishery may be obtained by adjoining the Schaefer model to the TG model (or any of the extension). This leads into a discussion of the fundamental variables in a dynamic analysis of the fishery problem and the limitations of published bioeconomic analyses. It is further pointed out that further work needs to be directed to the formulation of catch functions allowing for varying marginal returns with respect to fishing effort, in particular.
[14 references]

Author's abstract

9.2 (1.0158) HONG KONG ANNUAL DEPARTMENTAL REPORT FOR THE FINANCIAL YEAR 1970-71 (1ST APRIL 1970-31ST MARCH 1971)

Nichols, E. H. (Agriculture and Fisheries Dept., 393 Canton Road, Kowloon, Hong Kong)
Printed and published by J. R. Lee, Government Printer at the Government Press, Java Road, Hong Kong (n.d.), 90 pp. (Code No. 0342271) Price: Hong Kong $9.00.

This report, on the activities of the fisheries, is part of the Annual Departmental Report on the state of the industries.

Hong Kong has a total land area of 398½ sq mi and lies on the southeast coast of China. The mean daily temperature ranges from about 15° C in February to 28° C in July. About 9 in of rain falls from November to March, and about 76 in falls from April to September with the risk of typhoons. The topography is rugged and the soils are thin, acidic, and low in nutrients.

The waters of the continental shelf are fished, and many vessles venture as far as Hainan Island (240 mi southwest of Hong Kong). There were a total of 5,600 fishing vessels (75% are motorized) and an estimated 45,000 fishermen employed in 1970, a decrease in the number of vessels and fishermen from 1969. The fleet consists of four main groups: trawlers, long-liners, gill netters, and purse seiners.

As a result of government encouragement and technical advice, modernization has taken place in trawlers and long-liner types of vessels. Low-interest rate loans and funds from the commercial sector made possible completion of 764 new vessels.

The total domestic consumption of marine fish was estimated to be 100,000 metric tons. The fishing fleet output satisfied 94% of demand, and the balance

9.2 NEW VENTURE PLANNING: THE ROLE OF TECHNOLOGICAL FORECASTING

Blackman, A. Wade, Jr. (United Aircraft Research Laboratories, East Hartford, CT 06108)
Technological Forecasting and Social Change 5, No. 1, 25-49 (1973)

The author describes a system for the analysis and planning of new ventures that provides a structure for the application of logical, mathematical, and scientific procedures to decision problems which (1) involve a significant portion of an organization's resources, (2) have long-term effects on a firm's future success, and (3) are characterized by uncertainty in many factors important to the decision. The system is based upon the methodologies of technological forecasting, decision analysis, and systems dynamics.
[21 figures, 34 references]

FTP

9.3 RECENT DEVELOPMENTS IN THE LAW OF THE SEA IV: A SYNOPSIS

Greenblatt, Gershon D., James Robert Miller, and Alfred J. Waldchen
San Diego Law Review 10, No. 3, 559-598 (May 1973)

This fourth annual synopsis covers important events relative to the law of the sea that occurred from Feb. 1, 1972 to Jan. 21, 1973. The major sources of information for the synopsis were the New York Times, the Environmental Reporter, the United States Code Congressional and Administrative News, the Congressional Record, the United Nations Chronicle, and International Legal Materials. The subject areas covered are conservation, fishing, seabed resources, shipping, and sovereignty.
[101 footnotes]

FTP

9.2 ON INNOVATION, SOCIAL CHANGE, AND REALITY

Brewer, Garry D. (Rand Corp., Santa Monica, Calif.)
Technological Forecasting and Social Change 5, No. 1, 19-24 (1973)

Innovation in social affairs is a complex and demanding process; there are many general reasons why an innovation either fails to be realized or is incorporated in totally unforeseen ways, and there are important specific reasons, associated with individual contexts where innovation is taken, that must be taken into account. The would-be innovator and his ideas may fail if the idea of quid pro quo is ignored, if facile assumptions are made about the clarity and importance of the proposed changes, and if there is a failure to take into account a range of reactions and distortions of implementation. The concept of innovation may be thought of as a four-step process involving initiation, reaction or rejection, partial incorporation, and diffusion phases. Each phase, the author indicates, presents different problems and opportunities, and each must be considered seriously and explicitly if an innovation is to turn out even remotely as its proponents originally intended.
[7 references and a general bibliography of 8 references] FTP

9.3 THE OCEAN DUMPING CONVENTION -- A HOPEFUL BEGINNING

Leitzell, Terry L. (Dept. of State, Washington, D.C.)
San Diego Law Review 10, No. 3, 502-513 (May 1973)

The Convention on the Prevention of Marine Pollution By Dumping Wastes and Other Matter in the Oceans was opened for signature in Washington, Moscow, London, and Mexico City on Dec. 29, 1972; on that day it was signed by 27 States. This paper reports on the history of the Convention, the structure of the Convention, institutional arrangements for handling the responsibilities relative to the Convention, jurisdiction and enforcement of the standards set out in the Convention, and amendment procedures. The author believes that the Convention provides hope for the solution of global environmental problems, and that it will be the first step in a series of conventions and arrangements to protect the marine environment.
[46 footnotes] FTP

9.2 [COST OF LIVING AND PRICE OF FISH]
COSTO DE VIDA Y PRECIOS DE PESCADO

Malaret, A. E. (Proy. Desarrollo Pesq., Casilla de Correo 288, Mar del Plata, Argentina), O. J. Lascano, and A. A. Gumy
Publ. Proy. Desarr. Pesq. Gob. Argent. FAO, Mar del Plata, 42, 41 pp. (1972)
Aquatic Sciences & Fisheries Abstracts 3, No. 3, Abstract No. 3Q2937m, 195 (Mar. 1973)

An investigation was made of the effect the price of fish has on the cost of living in Argentina, and the effect the cost of living has on the price of fish. The following factors were also considered: the geographical reasons for price differences, distribution and other commercial aspects of marketing, types of fish and products involved, price fluctuations, monetary value of fish nutrients, and the relation between fish and meat consumption. Hake, sea bream, squid, and crustaceans were the food fish investigated.

Transport to interior markets can cause price increases by 100%. Intermediate fish handlers were found to absorb 40-70% of the sale price. Hake prices were mostly free from the influence of the price of meat, but the price of meat significantly influenced the demand for fish. In general, the survey indicated that fish represented good value in terms of nutrition per unit cost in Argentina. SW

9.2 (1.0158)

was imported from China. Sixty-six percent of the fleet output came from trawlers and was sold through wholesale fish markets operated by the department fish marketing organization. Fish landings from trawlers and purse seiners increased over 1969, while those from long-liners and gill netters decreased. The decrease in the catch by long-liners was attributed to a shortage of crew members.

Landings of marine fish were valued at $141 million, an increase of 16.5% due mainly to a rise in prices. The total production of marine and freshwater fish, crustacea, mollusks, aquarium fish, and fish oils and fertilizers was 123,448 metric tons valued at an estimated $327.6 million. This production was higher by 5.4% in quantity and 12.8% in value over 1969.

A total of 2,470 acres was devoted to fish farming. Grey mullet, silver, grass, and common carp, and big head were the main species cultivated. Production was estimated to be 2,266 metric tons valued at $15 million, a substantial increase over 1969.

Production of oyster meat was 142 tons--worth $1.409 million.

The Fisheries Research Division has been investigating marine resources, mariculture, and inland fish culture. The research vessel Cape St. Mary completed 17 trips including offshore cruises, studies in territorial waters, and training cruises for fishermen students.

Fisheries extension activities assisted fishermen in the socio-economic sphere by introduction of new and improved production techniques, equipment, and methods. Adequate credit was available, and improved marketing was provided. Training was made available in navigation, boat handling, engineering, and boat building. Co-op societies were encouraged to raise the standard of living through voluntary savings plans and better housing plans. Assistance for rehabilitation and relief from typhoon damage sustained by fishermen was provided. SW

9.3 (1.0112) A LIMITED ENTRY PROGRAM FOR ALASKA'S FISHERIES

Report prepared by the Governor's Limited Entry Study Group
A publication of the State of Alaska, Juneau, Alaska (Feb. 1973), 307 pp.

The material in this report was gathered to provide the information necessary to develop a program for limiting entry into Alaska's fisheries and applying that program to the salmon fishery. More data is being gathered in the study and will be presented in the future. The work of limiting entry will be carried out by a full-time regulatory commission and a professional staff. The commission will set a maximum allowable number of units of gear for each type of gear in the area studied. After gear levels are set up, the commission will set regulations for deciding who will get the entry permits. The regulations will then be used to set up a group of priority classifications into which applicants for entry permits will be divided. A crew member of a vessel will not be required to hold an entry permit. An entry permit will be like property; a person may keep it for life, sell it, or transfer it. A person may hold more than one permit so that he may fish more than one type of gear or fish in more than one area. If the commission found it necessary to reduce the number of permits already issued, holders of permits that were surrendered to the commission would be compensated. This system is applicable to commercial fishing only. Sport fishing or subsistence fishing are not affected by the limited entry proposal. The limited entry system will be independent of the existing licensing system associated with commercial fishing. The system is designed to relieve the fishing pressure on any species that is under such stress: salmon, crab, and shrimp. The report contains 82 tables that define the number of

9.3 NEW DEVELOPMENTS IN THE UNITED NATIONS SEABED COMMITTEE

Oda, Shigeru (International Law, Tôhoku University, Japan)
Journal of Maritime Law and Commerce 4, No. 4, 577-598 (July 1973)

Past developments of the law of the sea are examined and analyzed and then a brief view of possible future developments are discussed. Several conclusions are formulated: (1) It seems likely that exploitation of fishing in the offshore areas will probably be conducted under concessions granted by coastal States. Such a regime probably should be institutionalized in order to harmonize the interests of the coastal States and the interests of the distant-water fishing nations. An intermediate fishing zone may be suggested. (2) The road has been paved for international control of the ocean floor far from the continents. This trend may eventually be a model for the regime of fishing. (3) Regarding preservation of the marine environment, probably the flag State of the vessels should be responsible, with possible delegation of part of such compentence and responsibility to the coastal State, since the coastal State would be most seriously affected by the pollution of the ocean.
[35 footnotes]

FTP

9.3 (1.3) THE STATE-OF-ORIGIN AS GUARDIANS OF ANADROMOUS FISH: A PROPOSAL

MacKenzie, William H.
Special Publication Series 3, No. 1, 1-71 (May 1972). Published by the International Atlantic Salmon Foundation, 435 Park Ave., New York, N.Y.

The two principles of international law, upon which the maintenance of order in international fishery exploitation is based, are (1) a state exercises exclusive jurisdiction over waters adjacent to its coast and (2) beyond these waters there is freedom of fishing. The author suggests that these principles can be incompatible with rational fishery management because they do not recognize the special relationship which anadromous fish have with their state-of-origin. The author defines anadromous fish as those which hatch in fresh water, migrate to the ocean, and return to fresh water to spawn. The state-of-origin is the nation in whose fresh waters the fish spawn. The special relationship is based upon the homing instinct of anadromous fish which causes them to return to their parent stream for spawning. Survival of the species requires successful completion of the spawning stage of their life cycle. There is no provision in international law for a state-of-origin to regulate the harvest of anadromous fish when they are on the high seas beyond the jurisdiction of that state. The author proposes that international law should be modified to recognize the special relationship between anadromous fish and the state-of-origin by according such a state special authority over such fish. That authority would include the right to protect anadromous fish during their entire life cycle. The state-of-origin, in exercising its authority, becomes the

9.6 CHECK LIST OF PUGET SOUND FISHES

DeLacy, Allan C., Bruce S. Miller, and Steven F. Borton
Washington Sea Grant Program Report, WSG 72-3, (July 1972), iv + 43 pp. Published by the University of Washington, Division of Marine Resources, Seattle, WA 98195.

To relate the fishes listed to locations where they were reported, Puget Sound was defined as an area limited on the west by a line drawn northward from Ediz Hook, near Port Angeles, Wash., to the United States-Canada international boundary line and the line northward to the mainland. The region was further divided into 12 areas based on oceanographic conditions and intensity of the collecting efforts.

Fifty-eight families of fish were reported that include 191 species. The family Cottidae (sculpins) contained the largest number of species reported (36). The Pacific staghorn sculpin (Leptocottus armatus) was the most common. The family containing the next largest number of species reported was Scorpaenidae, the best known being rockfish (Sebastes spp.), with 24 species reported. Copper rockfish (S. caurinus) was reported 50 or more times in 7 of the 12 areas of the Sound.

There were two flounder families listed: Bothidae and Plauronectidae, with 16 species reported. Of these, English sole (Psettichthys melanostictus), rock sole (Lepidopsetta bilineata), and starry flounder (Platichthys stellatus) were the most commonly reported in the order listed. Pacific halibut (Hippoglossus stenolepis) was sighted 50 or times in the Strait of Juan de Fuca and a little less in Admiralty Inlet. (It was not common or absent elsewhere.)

9.3 (1.3)

guardian of the fish from its streams. If international law is not modified to recognize the special relationship, the author suggests, the alternatives available to the state-of-origin to protect its anadromous fish either fail to protect the interests of that state or are impractical. Such alternatives are, for example, extension of its territorial sea, or threatening to invoke retaliatory economic measures against uncooperating harvesting states, and others. The author discusses the alternatives and describes the guardianship principle in detail with citations and quotations from other sources to corroborate and validate his views. [4 figures, 111 references] SW

9.3 FREEDOM OF OCEANIC RESEARCH

Wooster, Warren S. (editor)
Crane, Russak and Company, Inc., 52 Vanderbilt Ave., New York, NY 10017 (June 1973)
276 pp. Price $14.00.
Ocean Development and International Law Journal 1, No. 2, 220 (Summer 1973)

This book is a review of the evolving law of the sea concerning oceanic research. The study was carried out by a group of social scientists from the Center for Marine Affairs, Scripps Institution of Oceanography, and other U.S. academic centers. The book should be of timely interest and importance to political scientists, oceanographers, and others concerned with international ocean affairs and the future of oceanographic research. FTP

9.3 (1.0112)

people in a fishery, years they have fished, number of vessels, value of vessels and gear by district, value of catch by year, amount of fish per vessel, type of gear, and amount of fish caught by year, earnings per vessel, and other information. Thirty figures show graphs that supplement the tables. A complete copy of the bill for limited entry, now before the Alaska Legislature, is also given. SW

9.3 INTERNATIONAL COMMISSION ON WHALING.
(1.953)(9.4) TWENTY-THIRD REPORT OF THE COMMISSION

Anonymous
Office of the International Commission on Whaling, Great Westminster House, Horseferry Road, London SW1P 2AE, England (1973), 264 pp. Price not given.

This report relates to the 23rd meeting of the International Whaling Commission held in Washington, D.C., June 1971, and to the meeting of the Scientific Committee held in London, June 1972. The International Observer Scheme was implemented by the whaling nations during the year. Further limitations on the catch of whales were also made for the 1971/72 and 1972 seasons. In 1972/73, the blue whale unit as a means of expressing catch limits in the Antarctic would be superseded by limits by species. Appendix IV contains the report of the Scientific Committee. FTP

9.6

The family Agonidae (poachers) was represented by 13 species reported. The most common species was the sturgeon poacher (Agonus acipenserinus).

Pricklebacks, family Stichaeidae, were listed with 11 species reported, the most common being snake prickleback (Lumpenus sagitta). Lumpfishes and snailfishes, family Cyclopteridae, were represented by 10 species reported, mostly from the San Juan Islands area.

The best known species of the family Hexagrammidae (greenlings) was lingcod (Ophiodon elongatus). It was well reported in all areas except South Puget Sound. Others of the family were not so common.

There were seven shark families reported with 10 species listed. The most common shark was the spiny dogfish, family Squalidae (Squalus acanthias), found everywhere in the sound. Five skates, family Rajidae, were reported. Many longnose skates (Raja rhina) were reported off Everett, Wash. The ratfish (Hydrolagus colliei), family Chimaeridae, was common throughout the sound. Very few sturgeons, family Acipenseridae, were reported.

The Pacific herring (Clupea harengus pallasi), family Clupeidae, was common throughout the sound. Two other species listed were not common.

Salmons and trouts, family Salmonidae, were listed with eight species reported. The most commonly reported were the salmons except in the Port Orchard area. Only chinook ventured there and everywhere else in the sound. The cutthroat trout (Salmo clarki) was most common in the sound, with rainbow (S. gairdneri) and Dolly Varden (Salvelinus malma) sharing the next lower position for trout.

The smelts were reported with five species, the most common being surf smelt (Hypomesus pretiosus).

An 18-page bibliography, useful as source material for the list, is also presented. SW

9.3 (9.11) EVOLUTION OF THE LAW OF THE SEAS -- DESTRUCTION OF THE PRISTINE NATURE OF BASIC OCEANOGRAPHIC RESEARCH

Robinson, George S. (Smithsonian Institution, Washington, D.C.)
Natural Resources Journal 13, No. 3, 504-510 (July 1973)

The author reviews briefly the attitudes, politics, technology, and economics influencing the use and potential use of the oceans in order to determine the majority view of nations regarding the present status of the law of the seas. The law of the sea, he suggests, serves as the foundation of all spirit, if not legal substance, upon which international economic and political agreements and treaties rest. He believes that one of the most, if not the principal, expendable item in the upcoming multilateral negotiations on the law of the sea is the scientific research of the oceans. This premise relative to such expendability is based on the views and the relative influential posture of coastal States, the impelling needs of three or four major military countries, and the scientists themselves who are directly involved in ocean research. The author believes that scientific investigators are relatively uninformed of the seriousness of the forthcoming Law of the Sea Conference regarding freedom of scientific research and that there has been no real success in establishing a sophisticated position regarding scientific investigation of coastal waters. Furthermore, he states that a working conference to educate scientists as to what is happening to the law of the sea and how the changes will affect oceanographic research is long overdue. The time for serious, realistic involvement of scientists is at hand.
[3 footnotes] FTP

7.43 (7.53) MOISTURE AND FAT ANALYSIS OF MEAT AND MEAT PRODUCTS: A REVIEW AND COMPARISON OF METHODS

Pettinati, Julio D., Clifton E. Swift, and Edward H. Cohen (Eastern Regional Research Laboratory, Agricultural Research Service, U.S. Dept. of Agriculture, Philadelphia, PA 19118)
Journal of the Association of Official Analytical Chemists 56, No. 3, 544-561 (May 1973)

The authors reviewed the published analytical methods for moisture and fat in meat and meat products. In this report, the various methods are briefly described, and certain characteristics of the methods are given such as time required for analysis, sample size, accuracy, precision, and cost of the equipment. These various characteristics are summarized in two tables for the most promising methods for moisture (13 methods) and for fat (18 methods). The most useful rapid methods for quality control in the meat industry are:

Moisture.--High temperature mechanical convection oven drying; hot plate drying; moisture balance; and azeotropic distillation.

Fat.--Modified Babcock procedures; X-ray transmission; specific gravity of hexane extracts; and determination of fat in the extract from azeotropic moisture analysis (a combined method).

[2 tables, 129 references] FTP

9.6 (9.) MAN AND THE OCEAN

Skinner, Brian J., and Karl K. Turekian (Yale University, New Haven, Conn.)
Prentice-Hall, Inc., Englewood Cliffs, N.J. (1973), viii + 149 pp. Price not given.

This textbook is for beginning students in the earth sciences. It is one of the Foundations of Earth Science Series by the same publisher. A chapter provides a description of the ocean basins and hydrology of the sea. Three chapters are devoted to ocean resources: fisheries, mineral, and chemical. Another chapter covers derivation of energy from ocean waters. Chapters on desalinization and pollution of the oceans conclude the book. Suggestions for further reading and an index are provided, and many illustrations are included. SW

9.6 (9.3)(9.6) AN ANNOTATED BIBLIOGRAPHY FOR ECONOMIC EVALUATIONS OF THE AQUACULTURE OF SELECTED CRUSTACEANS AND MOLLUSKS

Johnston, Warren E., and Don W. Collinsworth (University of California)
Sea Grant Publication No. 2, UC-IMR Reference No. 74-3, Institute of Marine Resources, University of California, P.O. Box 1529, La Jolla, CA 92037 (Aug. 1973), 26 pp. Price not given.

This bibliography contains a list of selected sources (111 references) of economic data and of economic analyses dealing with aquaculture of certain crustaceans and mollusks. It concerns primarily the northern lobster, but it also contains some references on the spiny lobster and on certain species of crabs, oysters, and shrimp. The authors prepared this report for circulation at this time because of the widespread interest in aquaculture. FTP

9.7 (9.6) A PRE-VIEW OF POLICY SCIENCES

Lasswell, Harold D.
Elsevier Publishing Co., New York (1971), 173 pp. $7.50
Garry D. Brewer (Rand Corp., Santa Monica, Calif.) (reviewer)
Technological Forecasting and Social Change 4, No. 4, 423-424 (1973)

The purpose of this book is to provide a handy guide to the theory, development, and future diffusion of policy science. Policy science deals with the solution of societal problems within prescribed space-time configurations or contexts; it is premised on the proposition that the problem at hand should suggest a full range of methods and questions of inquiry; and it relates directly to those having authority over the allocation of valued resources. The book deals with such matters as the evolution of policy science as a separate differentiated body of theory and practice; detailed requirements of a contextual multimethod approach to problem solving; extensive discussions of the policy process; problems of professional development and identification; and methods to train a corps of policy scientists. The reviewer also states that the book is a difficult, serious work that bears careful attention of researchers, students, and practitioners. FTP

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